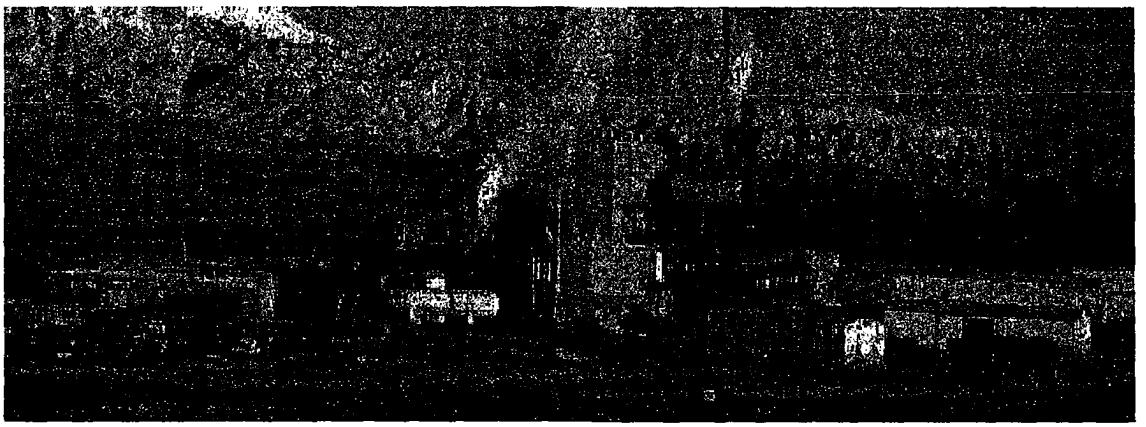
Tooele Chemical Agent Disposal Facility (TOCDF)



HAND DELIVERED

MAR 2 0 2008

UTAH DIVISION OF
SOLID & HAZARDOUS WASTE
08.01110

Request for a

CLASS 2 MODIFICATION

to the

TOCDF RCRA Permit

Request Number:	TOCDF-MPF-02-0960
Request Title:	Processing of 4.2-Inch HT Mortars
EPA ID Number:	UT 5210090002

For the:

STATE OF UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

Division of Solid and Hazardous Waste (DSHW)

1460 WEST 288 NORTH
P. O. BOX 144880
SALT LAKE CITY, UT 84114-4880

TABLE OF CONTENTS

1. DESCRIPTION OF CHANGE

OVERVIEW

The TOCDF operational history has shown that each munition type has unique characteristics that need to be identified prior to the beginning of the munition processing campaign to assure a successful campaign in regards to compliance with state and federal environmental regulations, and facility utilization. To allow time for the initial characterization and identification of the challenges unique to the processing of each Mustard munition type it was decided to seek RCRA Permit modifications for each munition type individually or in groups where similar applications of technology could address shared processing issues.

Upon completion of the 155mm Levinstein Mustard (H) Projectile Campaign, TOCDF will begin processing high heel Baseline Distilled Mustard (HD) Ton Containers (TC), which are those having solid heels greater than 630 pounds and a concentration of Mercury (Hg) in the liquid HD portion of the TC's fill of less than one part per million (ppm). These TCs will be processed using the Heel Transfer System (HTS). The 4.2 inch (") HT Mortar Campaign (the subject of this permit modification request) is anticipated to start in early December of 2008.

4.2" HT Mortars will be processed through the TOCDF in a similar manner as were projectiles during the GB and VX campaigns in that the energetic components will be removed in the Explosive Containment Rooms (ECRs) and processed in the Deactivation Furnace System (DFS), the liquid HT will be drained from the mortars and transferred to the Agent Collection System (ACS) Tanks for processing in the Liquid Incinerators (LICs). The drained mortars will then be fed to the Metal Parts Furnace (MPF). TOCDF has processed over one million projectiles in this manner.

This permit modification proposes to:

- Initially characterize 4.2" HT Mortars through execution of a Sampling and Analysis Plan that is submitted concurrently with this permit modification request. For the initial characterization the plan proposes to analyze HT liquid samples from the ACS-Tank and to sample a limited number of full trays of drained mortars for the occurrence of a paste-like heel and to collect and analyze a subset of mortars found to contain these heels. This issue is discussed in this permit modification request to provide background for the concurrently submitted sampling plan.

- Revise the TOCDF RCRA Permit Waste Analysis Plan (WAP) to include the characterization applicable to 4.2" HT Mortars and the on-going sampling and analysis requirements for the HT that is collected in the Agent Collection System (ACS) tanks. This change causes revision to Attachment 2 of the TOCDF RCRA Permit.

- Process HT 4.2" HT Mortar which have been drained of their agent fill weight to fixed heel weights that are greater than that which would result from a complete drain to compensate for a paste-like heel that may be encountered during processing. The modification proposes permit conditions to control the HT feed rate to the MPF that will both provide flexibility to the operator to select the best HT mortar processing heel weight, ensure compliance with the hourly mustard feed rate limit established during the MPF 155mm H Projectile Agent Trial Burn (ATB), and allow for the suspension of Discharge Air Lock (DAL) Low Temperature Monitoring (LTM) triggers associated with MPF Primary Combustion Chamber (PCC) zones provided other conditions are met. Maximum 4.2" HT Mortar heel weights are proposed to allow the operator the ability to adjust the amount of HT drained from the mortars such that the paste-like heel does not plug the Multipurpose Demilitarization Machine (MDM) drain tube used to remove the HT from the mortars. This change causes revision to Module V of the TOCDF RCRA Permit.

- Process HT 4.2" Mortars, some of which contain a paste-like heel that has been shown to contain mercury (Hg) at concentrations of approximately 200 ppm. The low frequency of occurrence and the limited amount of film found in the mortars provide assurance that compliance with the TOCDF RCRA Permit Hg Performance Standard will be maintained while processing these mortars. The methods used by TOCDF to ensure compliance with the TOCDF RCRA permit Hg Performance Standard are discussed in Section 2 of this permit modification. This issue is discussed but does not result in a change to the permit.

- Apply the practices applicable to waste management, agent monitoring, and waste analysis that were used during the HD and H campaigns to the HT campaign since all these agents are variants of Mustard (i.e., *bis* (2-chloroethyl) sulfide). This issue is discussed but does not result in a change to the permit.

- Increase the 4.2" HT Mortar storage capacity in the Explosive Containment Vestibule (ECV). This change causes revisions to Module III, and Attachments 5 and 12 of the TOCDF RCRA Permit.

- Revise the list of critical sensors applicable to the Projectile/Mortar Demilitarization Machines (PMDs) which are located in the Explosive Containment Rooms (ECRs) to account for the methods used to remove the energetic components from the mortars. The 4.2" HT Mortar fuze and burster are removed from as a single assembly. After removal the fuze is unscrewed from the burster; both items are then fed to the DFS.

- Revise the list of critical sensors applicable to the Multipurpose Demilitarization Machines (MDMs) which are located in the Munitions Processing Bay (MPB) to account for the methods used to open each mortar's agent cavity and drain the HT from the mortar. Mortar burster wells will not be reinserted into the mortar casing once the mortars have been drained, but instead removed burster wells will be discarded. Discarded burster wells will be collected in a container which, when full, will be placed

onto the feed tray along with the drained mortars and fed to the MPF. Alternatively, discarded burster wells may be processed as Miscellaneous Metals per the requirements applicable to Secondary Waste processing should equipment failures associated with the discarded burster container require such processing.

This request is classified as a Class 2 based on:

40 CFR 270.42 Appendix I, L.6.b - *If the waste does not contain a POHC that is more difficult to burn than authorized by the permit and if burning of the waste does not require compliance with different regulatory performance standards than specified in the permit;* and

40 CFR 270.42 Appendix I, B.1.d - *Changes to the WAP; Other Changes*

2. JUSTIFICATION FOR CHANGE

This section discusses the justifications for: 1) categorizing this change as a Class 2 Permit Modification; and 2) the proposed changes to the TOCDF RCRA permits listed in Section 1.

A. Permit Modification Classification

This change to the TOCDF RCRA Permit is submitted as a Class 2 Permit Modification based on 40 CFR 270.42 Appendix I, L.6.b which reads:

If the waste does not contain a POHC that is more difficult to burn than authorized by the permit and if burning of the waste does not require compliance with different regulatory performance standards than specified in the permit

HT is a variant of Mustard (H) and is a mixture of Bis(2-chloroethyl) sulfide (H) and Bis(2-chloroethylthio-ethyl)ether (T). The HT used to fill the 4.2" mortars in the DCD stockpile was manufactured in England and Canada. The HT was manufactured by reacting thiodiglycol with hydrochloric acid, the resulting percentages of H and T in the final mixture could be adjusted by controlling the temperature of the reaction. HT is comprised approximately of 60 weight percent H and 40 weight percent T and other higher molecular weight homologues of T (e.g., $ClCH_2CH_2S(CH_2H_2COCH_2CH_2S)_nCH_2CH_2Cl$). It was not made by mixing H and T together to create HT.

To process HT in the MPF and LICs does not require new agent trial burns for the LICs, MPF or DFS because distilled Mustard (HD), H, and HT are all addressed by the TOCDF RCRA Permit as Mustard (H/HD/HT). Permit Condition V.A.2.a requires a single Destruction and Removal Efficiency (DRE) demonstration for the Mustard series of agents, with *bis* (2-chloroethyl) sulfide being the Principle Organic Hazardous Constituent (POHC) upon which the DRE demonstration is made. This demonstration was performed during the LIC and MPF HD Agent Trial Burns (ATBs) that were conducted in the first quarter of 2007.

A DRE demonstration for the HD also serves as a DRE demonstration for H because both these agents are *bis* (2-chloroethyl) sulfide, the only difference being that HD is a purer form. The weight percent (wt.%) of the POHC *bis* (2-chloroethyl) sulfide in HD is approximately 89 wt.%, as compared to 60 wt.% for H.

A DRE demonstration for HD also serves as a DRE demonstration for HT because: 1) the wt.% of the POHC in HD is greater than HT which is approximately 60 wt. % *bis* (2-chloroethyl) sulfide, and 2) the degree of incineration difficulty, or the thermal stability, of *bis* (2-chloroethyl) sulfide is equal to or greater than that of the T component (i.e., *bis* (2-chloroethylthioethyl) ether) of HT. The following table was taken from a report titled Fate of EA2192 in UMCDF LIC Secondary Chamber by Reaction Engineering International; Salt Lake City, Utah October 5, 2007. Note number in the third column of the table; a lower Class (i.e., a lower number)

indicates a more difficult compound to incinerate.

Table 1 - Comparison of Calculated T99(2) (temperatures for 99% destruction in two seconds) and Associated Incinerability Rankings with Published Values for Other Compounds.

Compound	T99(2)	Class
Chlorobenzene	990 C (1814 F)	1
1,2,4-Trichlorobenzene	955 C (1751 F)	1
Tetrachloroethene	890 C (1634 F)	2
Vinyl Chloride	770 C (1418 F)	3
Trichloroethane	635 C (1175 F)	4
HD	**628 C (1162 F)**	**4**
H	**603 C (1117 F)**	**4**
HT	**578 C (1072 F)**	**5**
T	**562 C (1044 F)**	**5**
Chloroform	545 C (1013 F)	5
VX	541 C (1006 F)	5
GB	491 C (916 F)	5
EA2192	480 C (896 F)	5
Strychnine	320 C (608 F)	6

Additionally Table 2 show the incinerability ranking developed by EPA for compounds similar to (T).

Table 2 - Comparable Incinerability of T Based on EPA Ranking System

POHC	Ranking	Thermal Stability Class
MUSTARD GAS {bis[2-CHLOROETHYL]-SULFIDE} (H)	132-134	4
bis(2-CHLOROETHOXY)METHANE	189-192	4
bis(2-CHLOROETHYL)ETHER	183-186	4
bis[2-(2-CHLOROETHYLTHIO) ETHYL] ETHER (T)		**4 or 5**
bis(2CHLOROiSOPROPYL)ETHER	227-228	5
bis(CHLOROMETHYL)ETHER {METHANE-OXYbis[2CHLORO-1)	222-223	5
BROMOPHENYL PHENYL ETHER (4-) {BENZENEJ-BROMO-4-PHENOXY-}	226	5
CHLOROETHYLVINYLETHER (2-) {ETHENE,[2-CHLOROETHOXYI-}	211-213	5
CHLOROMETHYLMETHYL ETHER {CHLOROMETHOXYMETHANE}	218-220	5
Compound Ranking	**Temp Range (°C)**	**Class**
1-34	1,590-900	1
35-77	895-800	2
78-119	790-705	3
120-193	695-604	4
194-252	600-425	5
253-271	415-360	6
272-320	320-100	7

Table 2 source = EPA Handbook EPA/625/6-89/019, dated January 1989 and Titled
"Guidance on Setting Permit Conditons and Reporting Trial Burn Results, Appendix D Table D-1"

Note the bolded font in the Table 2 indicates the compound was not included in EPA ranking but was placed in the table based on its structure relative compounds that were similar in structure and included in EPA's table of evaluated compounds.

For the LICs, the feed rate of ash, chlorine, and metals associated with processing HT is less than that demonstrated during the previous HD ATBs. Additionally the feed rate of acid gas producing elements (i.e., chlorine and sulfur) will be less than what was demonstrated during the LIC HD ATB. The ash feed rate will be lower than what was demonstrated because during this ATB metal spikes were added to the feed. The metal spikes artificially increased both the ash and metal feed rates during the test. Table 3 and 4 show the anticipated feed rates of metals and acid gas producing elements to the LICs during the HT campaign.

Table 3 - LIC Metal Feed Rates During HT Campaign

Liquid HT Metal Content (mg/Kg)	Liquid HT Metals Concentrations[1]			Liquid HD TC Metals Concentrations[2]			LIC Metal Feed Rates @ 1208 lbs HT/hr			
							Limit	Expected	Limit	Expected
	Ave	Max	Min	Ave	Max	Min	lbs/24-hrs	lbs/24-hrs	lbs/12-hrs	lbs/12-hrs
Aluminum	0.68	0.93	0.25	7.07	37.9	4.38				
Antimony	0.059	0.062	0.055	0.175	2.79	0.086				
Arsenic	0.77	1.90	0.24	6.21	172	0.098				
Barium	0.030	0.062	0.014	0.346	1.26	0.085	0.2	0.002		
Beryllium				0.029	0 043	0.020				
Boron				4.13	10.4	3.53				
Cadmium	0.048	0.084	0.033	0.047	0.234	0.035				
Chromium	0.24	0.27	0.23	0.415	3.29	0.283			7.18*	0.06*
Cobalt				0.120	0.188	0.031				
Copper	1.9	3.5	1.0	36.2	372	2.96				
Lead	0.37	0.54	0.15	0.296	75.3	0.078			18.44*	0.01*
Manganese	0.080	0.320	0.009	0.799	8.14	0.095				
Mercury	0.020	0.023	0.018	0.246	0.385	0.153			0.0145	0.0003
Nickel	0.128	0.230	0.010	4.35	32.9	1.03				
Selenium	0.085	0.310	0.027	1.73	10.3	0.720	0.4	0.01		
Silver	0.081	0.140	0.047	0.636	10.8	0.488	0.2	0.004		
Thallium				0.043	0.082	0.033				
Tin	0.070	0.150	0.050	0.538	11.4	0.130				
Vanadium	0.12	0.18	0.09	0.089	0.224	0.060				
Zinc	16	18	14	8.03	1042	5.08				

[1]Source is Table 6-33 of Summary of Parsons Engineering Design Study I Projectile Washout System (PWS) Testing Volume 1 of 3, 14 August 2003.

[2]Source is review of analytical results for Baseline TCs sampled in Area 10.

*Represents sum of As+Be+Cr or Cd+Pb.

Table 4 - LIC Acid Gas Producing Element Feed Rate During HT Campaign

Compound	Chemical Formula	Molecular Wt.	Cl wt%	Cl feed Rate @ 1208 lbs/hr	
				H (lbs Cl /hr)	HT (lbs Cl/hr)
Mustard (H)	$C_4H_8Cl_2S$	159.1	45%	538	
O Mustard (T)	$C_8H_{16}Cl_2S_2O$	263.25	27%		453
Compound	**Chemical Formula**	**Molecular Wt.**	**S wt%**	**S feed Rate @ 1208 lbs/hr**	
				H (lbs S/hr)	**HT (lbs S/hr)**
Mustard (H)	$C_4H_8Cl_2S$	159.1	20%	243	
O Mustard (T)	$C_8H_{16}Cl_2S_2O$	263.25	24%		264
Total H Acid Gas Producer (S + Cl) Feed Rate (lbs/hr) ⇒				**782**	
Total HT Acid Gas Producer (S + Cl) Feed Rate (lbs/hr) ⇒					717

Note: For this evalation H is taken as 100 wt% H and HT is taken at 60 wt% H and 40 wt.% T.

The feed rate of HT to the MPF will be less than the feed rate of Mustard which was demonstrated during the MPF HD Ton Container (TC) and 155mm H Projectile ATBs. The demonstrated charge weight and feed rate limits from the MPF HD Ton Container (TC) ATB was 630 lbs/charge and 256 lbs/hr, respectively. The P999 waste feed rate demonstrated during the MPF 155mm H Projectile ATB was 370 lbs/hr. The maximum charge weight and feed rate of HT to the MPF based on the proposed permit conditions cannot exceed 167 lbs/charge and 250 lbs/hr respectively (see Table 5 below).

Table 5 - MPF 4.2" HT Mortar Feed Rates

Charge Interval (min/charge) ⇒		40*	45*	55*	65*	75*
Mortars/tray (No.) ⇒	96					
HT/Mortar (lbs) ⇒	5.8					
	HT	HT to MPF	HT to MPF	HT to MPF	HT to MPF	HT to MPF
	(lbs/tray)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)
HT/Tray @ 5% Heel	27.8	41.8	37.1	30.4	25.7	22.3
HT/Tray @ 10% Heel	55.7	83.5	74.2	60.7	51.4	44.5
HT/Tray @ 15% Heel	83.5	125.3	111.4	91.1	77.1	66.8
HT/Tray @ 20% Heel	111.4	167.0	148.5	121.5	102.8	89.1
HT/Tray @ 25% Heel	139.2	208.8	185.6	151.9	128.5	111.4
HT/Tray @ 30% Heel	167.0	**250.6**	222.7	182.2	154.2	133.6

*Charge Intervals include nominal 5 minute tray transfer time (e.g., 40 minute charge interval equals 35 maximum Zone Timer plus 5 minutes tray transfer time).

The chlorine feed rate to the MPF will be less during the 4.2" HT Mortar processing than 155mm H projectile processing because the projectiles were processed without being drained and the mortars will be drained of most of their agent fill before being processed.

There have been reports that varying quantities of silver solder were used in the fabrication of 4.2" mortars. To evaluate the impact of the metals associated with the mortar casings, to include this silver solder, a review of the Johnston Atoll Chemical Agent Disposal System (JACADS) MPF 4.2" HD Mortar ATB Report, dated August 1999 was conducted. Metal emission rates documented in this report were used to prorate anticipated metal emission rates from the TOCDF MPF during the 4.2" HT Mortar Campaign. The emission rates were prorated using the differences between the JACADS and TOCDF charge rates and exhaust gas flow rates and compared to the emission rates modeled in the Deseret Chemical Depot (DCD) Human Health Risk Assessment (HHRA) of September 2003. Table B-21 of Appendix B of the assessment is specific to MPF Mustard operations.

This evaluation assumes that all the metals in the exhaust gas were contributed from the munition casings. This is a worst case assumption since full trays of un-drained 4.2" HD Mortars were fed during the JACADS ATB; the solids in HD mortars are known to contain high concentrations of arsenic, cadmium, chromium, lead, Hg, and silver. TOCDF will process 4.2" HT Mortars having at most 30 percent agent heels. It is also reasonable to use this JACADS ATB data because of the similarity between the TOCDF and JACADS MPFs and because the fabrication of the 4.2" mortars was the same whether they were filled with HD or HT.

Table 6 below shows the prorated TOCDF emissions and the emission rates modeled in the DCD HHRA. The prorated emission rates for all metals (including silver) but five are less than the rates modeled in the HHRA. For the five metals having prorated emission rates greater than the value used in the HHRA, the difference between the emission rates was not greater than an order of magnitude.

Table 6 - TOCDF Metal Emission Rates Prorated w/ JACADS MPF 4.2" HD "Full-Up" Mortar ATB Results

JACADS MPF Exhaust Gas Flow Rate (dscfm)[1]	4562	4371	TOCDF MPF Exhaust Gas Flow Rate (dscfm)[3]
JACADS MPF Exhaust Gas O_2 Concentration (%)[1]	11.0	11.7	TOCDF MPF Exhaust Gas O_2 Concentration (%)[3]
JACADS 4.2" HD Mortar Charge Interval (min)[2]	54	40	TOCDF 4.2" HT Mortar Charge Interval (min)

Metal	JACADS Exhaust Gas Metal Conc. (ug/dscf)[4]	JACADS Emission Rate (g/sec)[4]	TOCDF Emission Rate Prorated w/ Charge Interval (g/sec)	TOCDF Emission Rate Prorated w/ Charge Interval and Flow Rate (g/sec)	DCD HHRA Sept 2003 Table B-21 Metal IRAP-h Emission Rate (g/sec)
Aluminum	<5.616	4.27E-04	5.76E-04	5.52E-04	5.18E-04
Antimony	<0.006	4.56E-07	6.16E-07	5.90E-07	7.75E-07
Arsenic	0.022	1.67E-06	2.26E-06	2.16E-06	2.79E-06
Barium	<0.445	3.38E-05	4.57E-05	4.38E-05	4.03E-05
Beryllium	<0.004	3.04E-07	4.11E-07	3.93E-07	4.77E-07
Boron	3.23	2.46E-04	3.32E-04	3.18E-04	2.83E-04
Cadmium	<0.541	4.11E-05	5.55E-05	5.32E-05	6.48E-05
Chromium	<0.021	1.60E-06	2.16E-06	2.07E-06	2.20E-06
Cobalt	<0.078	5.93E-06	8.01E-06	7.67E-06	1.66E-05
Copper	<0.066	5.02E-06	6.77E-06	6.49E-06	8.72E-06
Lead	0.127	9.66E-06	1.30E-05	1.25E-05	1.35E-05
Manganese	1.246	9.47E-05	1.28E-04	1.23E-04	2.66E-04
Mercury	<2.880	2.19E-04	2.96E-04	2.83E-04	4.45E-04
Nickel	<0.147	1.12E-05	1.51E-05	1.45E-05	1.78E-05
Selenium	<0.005	3.80E-07	5.13E-07	4.92E-07	5.17E-07
Silver	<0.061	4.64E-06	6.26E-06	6.00E-06	7.67E-06
Tin	<1.108	8.42E-05	1.14E-04	1.09E-04	1.54E-04
Vanadium	<0.023	1.75E-06	2.36E-06	2.26E-06	2.44E-06
Thallium	<0.002	1.52E-07	2.05E-07	1.97E-07	1.74E-07
Zinc	2.13	1.62E-04	2.19E-04	2.09E-04	2.08E-04

	Value	Limit
Ave. JACADS Cd+Pb Emissions @ 7% O_2 (µg/dscm) ⇒	33	230
Ave. JACADS As+Be+Cr Emissions @ 7% O_2 (µg/dscm) ⇒	2	92
Max. JACADS ParticualteEmissions(gr/dscf)[5] ⇒	0.0015	
Max. JACADS ParticualteEmissions @ 7% O_2 (gr/dscf)[5] ⇒	0.0020	0.015
TOCDF Charge Interval Prorated Cd+Pb Emissions @7% O_2 (µg/dscm) ⇒	48	
TOCDF Charge Interval Prorated Cd+Pb Emissions @7% O_2 (µg/dscm) ⇒	3	
TOCDF Charge Interval Prorated Particulate Emissions @7% O_2 (µg/dscm) ⇒	0.003	

[1]Average of values fromTable 2-4a of JACADS 4.2" HD Mortar ATB Report dated August 1999.

[2]FromTable 1-1 of JACADS 4.2" HD Mortar ATB Report dated August 1999.

[3]Average of values fromTable 5-30 of TOCDF HD ATB Report-Rev. 0, dated March, 2007.

[4]Average of values fromTable 2-4 of JACADS 4.2" HD Mortar ATB Report dated August 1999.

[5]Maximum value fromTable 2-2a of JACADS 4.2" HD Mortar ATB Report dated August 1999.

In conclusion, ATBs are not required to process HT in the TOCDF incinerators because the

compound T has an equal or lesser degree of incinerability difficulty than does HD and H, the feed rates of ash and chlorine are less than what was demonstrated during the LIC and MPF HD ATBs, and a worst case metal emissions evaluation shows comparable emission rates to those used in the DCD HHRA. This modification is therefore correctly classified as a Class 2 Permit Modification.

B. Proposed Changes to the TOCDF RCRA Permit

Initial 4.2" HT Mortars Characterization

An initial characterization of the HT with the 4.2" Mortars will be conducted. A detailed characterization plan has been submitted with this permit modification request. A summary of the characterization plan follows.

An ACS Tank will be filled with HT drained from 4.2" HT mortars from the seven different manufacturing lots comprising the DCD 4.2" HT Mortar stockpile. At least one full tray of 96 mortar rounds from each lot will be drained into the ACS Tank. ACS-Tank-101 has sufficient storage capacity to hold agent drained from over 900 4.2" HT Mortars. Seven trays of mortars represent about 700 mortars and 370 gallons of liquid HT. Filling the tank with agent from all seven manufacturing lots and then mixing the contents will ensure a representative sample of the liquid HT is collected and analyzed.

4.2" HT Mortars from the DCD stockpile were used in a study conducted by Parsons to test a Projectile Washout System (PWS). Some of the mortars used during this testing were found to contain a paste-like heel. Three samples of paste-like heel were analyzed and found to contain Hg at concentrations of approximately 200 parts per million.

The initial HT mortar characterization plan describes how after the mortars used to fill one of the ACS tank have been drained, an assay of a representative number of mortars will be conducted to determine the frequency of occurrence of the paste-like heel. The plan also describes how samples of the heel will be collected from a subset of the mortars found to contain it.

The following is a summary of the results taken from the Parsons PWS Test Report concerning the characterization of DCD 4.2" HT Mortars.

Samples collected and analyzed during the previously referenced Parsons PWS testing included liquid HT and the paste-like heels taken from DCD 4.2" HT Mortars.

Regarding the paste-like film heels:

1. Sixty-six (66) 4.2" HT Mortars were used in the Parsons PWS study.
2. Mortars were from two lots TOD-500-1 (31 mortars) and TOD-500-6 (35 mortars).
3. 12 of 66 mortars were found to have solid heels.
4. For 8 of the 12 mortars with solid heels, the solids were described as purple with a taffy-like viscosity.

5. No solids were found in mortars from lot TOC-500-1. All 12 mortars with solid heels were from TOD-500-6.
6. Only the paste-like heels described as being purple were analyzed. Three samples were analyzed from three different mortars, each sample was found to contain Hg; the concentrations ranging from 180 to 210 ppm.
7. The average heel weight for mortars found to contain solid heels was 4.9 wt. %
8. The average heel weight for mortars found not to contain solid heels was 1.5 wt. %. Note this heel weight can be taken as a baseline heel value for all 4.2" HT Mortars, which allows for the development of item 9 below.
9. The increase in heel weight, or the average weight of the paste-like heel is 4.9 wt.% - 1.5 wt.% = 3.4 wt.% or 5.8 lbs * 0.034 = 0.2 lbs.

Regarding the liquid HT:

1. Liquid HT samples were collected from Lots 500-1 and 500-6.
2. Samples were collected from five mortars (two from Lot 500-1; three from 500-6).
3. One liquid HT samples was taken from the PWS agent collection tank. The tank held HT from six mortars belonging to Lot 500-1 and three mortars belonging to Lot 500-6.
4. The organic analysis was conducted using three different methods; the Nuclear Magnetic Resonance (NMR) based method provided the mass balances best approaching 100 percent.
5. Metal analysis was conducted using Inductive Coupled Plasma Mass Spectrometry (ICP/MS)
6. Hg was found in the liquid HT samples at concentrations ranging from 0.018 to 0.023 ppm.
7. Arsenic (As) was found in the liquid HT samples at concentrations ranging from 0.24 to 1.9 ppm. Note past analytical results obtained during different agent and munitions campaigns have shown a link between the occurrence of Hg (at concentration measured in hundreds of ppm) and As (at concentrations measured in thousands of ppm) and the use of reconditioned TCs that previously held Lewisite. The low Hg and As concentrations found in the DCD 4.2" HT Mortars indicate that the HT used to fill TOCDF 4.2" Mortars was not transferred from TCs that previously contained Lewisite.

   Note, a review of historical records concerning the 4.2" HT Mortar stockpile indicates the DCD HT lots are comprised of mixed manufacturing lots because of renovations that have occurred over the years. The renovations did not result in changes to the agent fill, but they did result in the assignment of the new lot numbers. Therefore, the significance of the DCD lot numbers is minimized when attempting to make distinctions based on them.

Table 7 provides a summary of analytical results presented in the Parson PWS report.

Table 8 provides a bounding estimate of the total Hg emissions associated with the processing of the DCD stockpile of 4.2" HT Mortars.

Table 7 - Parsons PWS Report HT Analysis Summary

Liquid HT Organic Compounds (wt.%)	Liquid HT[1,3]			Purple Paste[2,4]			Purple Paste Organic Compounds (wt.%)
	Ave	Max	Min	Ave	Max	Min	
Bis (2-chloroethyl) sulfide (HD Agent)	56.5	60.1	52.3	0.84	1.6	0.44	1,4-Dithiane
bis [2-(2-chloroethylthio)ethyl] ether (T)	32.7	36.5	28.5	1.5	2.8	0.81	1,4-Thioxane
1,2-*bis* (2-chloroethylthio) ethane (Q)	4.7	6.0	3.4	0.09	0.13	0.07	1,4-dithioniabicyclo[2.2.2.] octane dichloride
2-(2-chloroethythio) ethyl 2-chloroethyl ether	5.3	6.4	3.8	4.6	5.6	3.0	S-(2-chloroethyl)-1,4-dithianium chloride
1,2-Dichloroethane	0.7	1.0	0.3	2.6	3.4	1.6	S-(2-hydroxyethyl)-1,4-dithianium chloride
1,4-Dithiane	1.5	2.0	1.4				Bis[2-(1,4-oxathianium)-S-ethyl] ether[2]
1,4-Thioxane	0.5	0.5	0.4	90	93	87	2-(1,4-dithianium)-S-ethyl 2-(1,4-oxathianium)-S ethyl ether[2]
							Bis [2-91,4-dithianium)-S ethyl] ether[2]

Liquid HT Metal Content (mg/Kg)	Liquid HT Metals Concentrations			Purple Paste Metals Concentrations			Purple Paste Metal Content (mg/Kg)
	Ave	Max	Min	Ave	Max	Min	
Aluminum	0.68	0.93	0.25	1.02	1.1	0.86	Aluminum
Antimony	0.059	0.062	0.055	0.25	0.34	0.19	Antimony
Arsenic	0.77	1.90	0.24	2.3	2.8	1.6	Arsenic
Barium	0.030	0.062	0.014				Barium
Beryllium				0.024	0.028	0.021	Beryllium
Boron							Boron
Cadmium	0.048	0.084	0.033	4.6	5.4	4.1	Cadmium
Chromium	0.24	0.27	0.23	15	23	5.8	Chromium
Cobalt				1.8	1.9	1.7	Cobalt
Copper	1.9	3.5	1.0	120	140	110	Copper
Lead	0.37	0.54	0.15	1210	3100	130	Lead
Manganese	0.080	0.320	0.009	670	730	630	Manganese
Mercury	0.020	0.023	0.018	197	210	180	Mercury
Nickel	0.128	0.230	0.010	4.0	4.6	3.3	Nickel
Selenium	0.085	0.310	0.027	0.13	0.20	0.024	Selenium
Silver	0.081	0.140	0.047	0.092	0.13	0.053	Silver
Thallium							Thallium
Tin	0.070	0.150	0.050	4.7	5.8	4.2	Tin
Vanadium	0.12	0.18	0.09	0.11	0.13	0.10	Vanadium
Zinc	16	18	14	203	220	180	Zinc

[1]Organic Analysis by Nuclear Magnetic Resonance (NMR)

[2]Concentration of these ethers is determined as 100% minus the sum of the analytes that are ethers based on comments made in PWS Report by NMR analyst and not through actual analysis.

[3]Source is Table 6-33 of Summary of Parsons Engineering Design Study I Projectile Washout System (PWS) Testing, Vol. 1 of 3, 14 August 2004.

[4]Source is Table 6-37 of Summary of Parsons Engineering Design Study I Projectile Washout System (PWS) Testing, Vol. 1 of 3, 14 August 2004.

Table 8 - Potential 4.2" Ht Mortar Campaign Hg Emissions Based on Parsons PWS Report Data

	Case 1	Case 2	Case 3	Case 4
Hg/Solid Heel				
Population includes	TOD-500-1 & TOD-500-6	TOD-500-6	TOD-500-6	TOD-500-1 & TOD-500-6
Population size	66	35	35	66
Incidence of Solids Basis	All heels	Only heels identified as purple taffy	All heel identified as solids or purple taffy	All heels identified as solid or purple taffy found in lot 500-6 applied to all lots
Incidence of Solids Ratio	12:66	8:35	12:35	12:35
Incidence of Solids (%)	18%	23%	34%	34%
Solid Heel Mass wt% Basis	Average of all heels	Average of all heel identified as solids and purple taffy - Average of heels identified as no solids (baseline heel)	Average of all heel identified as solids and purple taffy	Average of all solid heels
Solid Heel Mass (wt% of initial fill)	2.24%	3.38%	4.94%	4.94%
Initial 4.2" HT Mortar Fill wt (lbs)	5.8	5.8	5.8	5.8
Solid Heel Hg Concentration (mg/Kg)	197	197	197	197
Hg/Solid Heel Considered (lbs)	2.56E-05	3.86E-05	5.64E-05	5.64E-05
Projected Hg/4.2" HT Mortar Campaign				
No. of Mortars in Stockpile Considered Basis	Lots 500-1 thru 500-7	Lots 500-2 thru 500-7	Lots 500-2 thru 500-7	Lots 500-1 thru 500-7
Basis Assumes	All Lots are represented by the combination of 500-1 and 500-6	Lot 500-1 is unique and the remainder of the lots are represented by Lot 500-6	Lot 500-1 is unique and the remainder of the lots are represented by Lot 500-6	All lots are represented by Lot 500-6
No. of Mortars in Stockpile Considered (no)	62524	49554	49554	62524
No. of Hg Containing Mortars (No)	11368	11327	16990	21437
Projected MPF Hg/4.2" HT Mortar Campaign (lbs)	**0.29**	**0.44**	**0.96**	**1.21**
Total HT to LICs (lbs)	362639			
HT Hg Concentration (mg/Kg)	0.02			
LIC Agent Feed Hg Concentration Default; value used in calculation (mg/Kg)	0.45			
Projected LIC Hg/4.2" HT Mortar Campaign (lbs)	0.16	0.16	0.16	0.16
Total Hg/HT Mortar Campaign (lbs)	**0.5**	0.6	1.1	**1.4**
	most probable			**least probable**

DCD 4.2" HT Mortar Inventory

DCD Lot Number	No. in Lot
TOD-500-1	12,970
TOD-500-2	10,579
TOD-500-3	7,461
TOD-500-4	8,410
TOD-500-5	12,385
TOD-500-6	10,621
TOD-500-7	98

Total	62,524
Total Excluding TOD-500-1	49,554

WAP Revisions

Attachment 2, Waste Analysis Plan (WAP) is proposed to be revised to include the sampling requirements for the HT transferred to the ACS tanks. The proposed sampling frequency is one sample from an ACS tank per week. ACS tanks are managed as batch tanks, meaning the required sample will be collected when the operator has determined no additional agent will be added to the tank until the contents of the tank are processed. Metals analysis will be performed on each liquid HT sample collected from the ACS tanks, an organic analysis will be performed on every fifth ACS tank sampled.

Samples of the paste-like heel will be collected and analyzed during the initial waste characterization only. TOCDF does not intend to collect any additional samples of this matrix because TOCDF will continuously sample, and analyze MPF exhaust gas samples for Hg concentrations throughout the entire 4.2" HT Mortar Campaign (see section on Hg management below).

The justification for an ACS-Tank sampling frequency of once per week is based on:

- Historical records of the 4.2" HT Mortar manufacture and renovations which show the DCD lots are a mix of multiple original manufacturing lots.
- Analytical results obtained during the Parsons PWS test which show little variation metals and organic content of mortars which were essentially selected at random because of the mixing of lots resulting from past renovations of the mortars.
- Anticipated results from the ACS-Tank samples that will be collected and analyzed per the 4.2" HT Mortar Sampling and Analysis Plan, which is submitted concurrently with this permit modification request.

MPF 4.2"HT Mortar Processing

Previous MPF ATBs conducted at TOCDF and JACADS have demonstrated the ability of an MPF to successfully process munitions containing 100% of their original agent fill (i.e., a 100% heel). TOCDF intends to process 4.2" HT Mortars that have been drained to fixed heel weights which will be no greater than 30% of the original agent fill weight.

PWS testing performed by Parsons at the Chemical Agent Munitions Disposal System (CAMDS), which used 4.2" HT Mortars stored at DCD as test materials, showed some of the mortars contained a paste-like heel which had accumulated primarily at the bottom of the inside of the mortar. When present this heel comprised on average approximately four percent of the agent fill weight.

To prevent the drain probe of the Multipurpose Demilitarization Machines (MDMs) from being plugged by this paste-like heel, the drain probe will not be inserted into the mortar to the fullest extent possible, but instead inserted to a depth that ensures if a worst case amount of heel were present, the heel would not be sucked into the drain probe which would likely cause it to plug.

The collective amount of heel remaining in the mortars comprising a full tray will be a fraction of the charge weight successfully demonstrated during the MPF HD TC and MPF H 155mm Projectile ATBs. Table 5 above shows this comparison.

TOCDF intends to initially control the drain of 4.2" HT Mortars such that a 15 weight percent heel results, and believes this heel weight will be sufficient to prevent plugging of the drain probe based on the data generated by the Parsons PWS test. However, a heel weight limit of 30 weight percent is proposed should the intended 15 weight percent heel drain prove ineffective in preventing plugging of the drain probe. Permit Conditions V.C.1.a.i.d through V.C.1.a.i.d.iv are proposed to manage potential transitions between heel weights should they be required.

Permit Condition V.C.1.a.i.d is proposed to ensure complete combustion of the HT heel fed with the mortars occurs in Zone 1 of the MPF regardless of the heel weight selected. Heat added to the zone from the combustion of the agent heel elevates the zone temperate above the temperature control setpoint. The water sprays are used to lower the zone temperature which is being elevated by the combusting agent heel. For the temperature measured by the zone temperature controller to return to its setpoint requires the only combustion source in the zone to be the four natural gas burners located in the zone. This, combined with the closing of the zone water spray valve, indicates the agent heel combustion has completed; when the heel is combusted the water sprays are no longer needed.

Permit Condition V.C.1.a.i.d.i is proposed to allow for a direct determination of compliance to be made. It would be difficult to determine compliance if each mortar on a tray were drained to a different heel.

Permit Condition V.C.1.a.i.d.ii is proposed to allow for a method to transition from different agent heel weights should it be required to leave more agent in a drained mortar to prevent plugging of the agent drain probe.

Permit Condition V.C.1.a.i.d.iii is proposed to limit the weight of agent heel that be fed with 4.2" HT Mortars. This condition coupled with the specified minimum zone time of 35 minutes ensures compliance with the MPF agent feed rate limit demonstrated during the MPF ATBs. The maximum HT mortar agent feed rate is calculated as 96 (mortars/tray) * 5.8 (lbs HT/mortar) * 0.3 * 1 tray/(5 minute tray transfer time + 35 minute zone time) * 60 minutes/hr = 250 lbs HT/hr. The hourly agent feed rate demonstrate during the MPF 155mm H Projectile ATB was about 370 lbs/hr.

Permit condition V.C.1.a.i.d.iv is proposed to make unnecessary the MPF Discharge Air Lock (DAL) Low Temperature Monitoring (LTM) requirements associated with the high temperature in Zones 1, 2, and 3 of the MPF PCC and the PCC exhaust gas temperature. If approved this

permit condition would still require DAL LTM if the value of operating parameters other than those previously referenced exceed the values specified in existing Permit Condition V.C.2.r, but there would be no LTM triggers for the previously referenced parameters unless TOCDF needed to leave 30 weight percent heel in the 4.2"HT Mortars to prevent plugging of the drain probe.

The justification for managing HT mortar LTM in this manner is:

The LTM triggers associated with PCC zone and exhaust gas temperatures were initially established to detect an overfeed condition (i.e., a tray of drained munitions fed to the MPF having combined heel weight greater than five percent of the original fill weight of the munitions on the tray). The higher than expected temperatures in the zones or the exhaust gas would trigger LTM to ensure the excess agent on the tray of waste was completely destroyed before the tray exited the DAL. Without DAL LTM, a tray of munitions having an agent heel weight greater than expected had the potential of exiting the DAL still containing untreated agent because the MPF PCC zone times were established, and known to be effective in treating a specific heel weight. A tray of munitions having a greater heel weight than typically fed to the MPF should stay in the PCC longer to ensure the complete treatment of the agent.

Proposed Permit Condition V.C.1.a.i.d, if implemented, would make the PCC temperature related LTM triggers unnecessary because it would make Zone 1 of the PCC a "flex" zone (i.e., a zone that will not advance a tray of drained munitions to the next zone until the agent on the tray is destroyed rather than a zone that advances a tray of munitions when a zone timer has expired). For a tray to advance requires three conditions to be met; the zone timer must expire, the temperature in the zone must return to within 10 °F of the zone temperature control setpoint (which signifies combustion of the agent heel is complete, regardless of its size), and the zone water spray valve must be closed (which signifies combustion is complete since no more water spray is required for cooling of the combusting agent heel). Managing Zone 1 in this manner assures trays of drained munitions will remain in the PCC long enough to completely destroy the agent heel.

MPF 4.2" HT Mortar Processing Hg Feed Rate Management

TOCDF has over one year of experience in managing MPF Hg feed rates such that the resulting exhaust gas concentrations do not exceed state and federal emission standards.

The Parsons PWS test report shows that some of the DCD 4.2" HT Mortars contain minimal amounts of Hg. The Hg is contained in the paste-like heel which adheres to the interior of the mortar casing and remains within the casing after it is drained and thus fed to the MPF as part of the un-drained heel. The HD Baseline TCs processed by TOCDF from 1 August 06 through 31 October 07 were also known to contain minimal amounts of Hg.

TOCDF is required to comply with federal and state hazardous waste incinerator performance standards when waste is in the combustion zones (see TOCDF RCRA Permit Condition VI.A.3.a.i). TOCDF was required to comply with these same performance standards throughout the Baseline HD TC Campaign.

TOCDF has permitted and implemented through Region 8 of the United States Environmental Protection Agency (EPA) a continuous MPF exhaust gas sampling method that generates samples periodically which in turn are analyzed for Hg. This sampling process essentially creates a continuous measure of compliance with the Hg performance standard, which is 130 micrograms per dry standard cubic meter corrected to seven percent oxygen over a twelve-hour rolling average (130 µg/dscm @ 7% O_2). EPA approved Hg exhaust gas sampling was used throughout the Baseline TC Campaign to quantify and control MPF Hg emissions. TOCDF will manage the feed rate of Hg to the MPF during the 4.2" HT Mortar Campaign in a manner similar to the Baseline TC Campaign.

Exhaust samples are taken for a nominal four-hour period. MPF exhaust gas is passed though a series of carbon absorption tubes, Hg present in the exhaust gas is deposited onto the absorption tubes. Compliance with the Hg performance standard is based on the rolling average of three four-hour sample results, corrected to 7% O_2 (the O_2 correction value is obtained from the TOCDF exhaust gas O_2 Continuous Emission Monitoring Systems [CEMS] that are co-located alongside the Hg exhaust gas sampling probes). The three four-hour sampling periods comprising the average allow time for TOCDF to make adjustments to the waste feed rate should the limit of the performance standard be approached. The adjustments include skipping feed cycles to the batch-feed operated MPF.

TOCDF also uses a second non-regulated Hg exhaust gas sampling method from which processing decisions are made. Samples are collected during times when the wastes are in the first zone of the three-zone MPF Primary Combustion Chamber (PCC); the time when the waste is burning at its highest rate and the Hg, if present in the waste, is evolving. This shorter sampling time, along with the use of a sample analysis method that provides a result (but that also destroys the sample) in shorter time than the regulated exhaust gas sampling method, allows TOCDF to determine if any individual TC or tray of 4.2" mortars contained more Hg than anticipated. If the results from this second unregulated MPF Hg exhaust gas monitoring method show a spike in exhaust gas Hg concentrations then the feeding of the next TC or tray of mortars can be postponed to allow the compliance based rolling average exhaust gas Hg concentration to reduce, thus preventing an exceedance of the performance standard.

The use of both the regulated and unregulated MPF Hg exhaust gas sampling/analysis methods and TOCDF's successful past experience managing Hg emissions during the Baseline TC campaign provide assurance of continued compliance with the RCRA Permit specified Hg performance standard throughout the 4.2" HT Mortar Campaign.

Applicability of H and HD Agent Monitoring and Waste Management Practices to HT

TOCDF intends to use the same hazardous waste management practices, in regards to agent monitoring and waste analysis, for HT as were used for H and HD (i.e., bis [2-chloroethyl]-sulfide).

Facility Automatic Continuous Air Monitoring Systems (ACAMS), to include those monitoring

incinerator exhaust gas in the Common Stack and incinerator exhaust ducts, will be configured to detect the H component of HT. Waste residues, to include those previously treated by decontamination solution and those previously treated by incineration which are currently required to be monitored for agent will be monitored for the H component (i.e., bis[2-chloroethyl]-sulfide) of HT. Waste residues currently required to be screened for agent content with the results being compared to the Waste Control Limit (WCL, which for H/HT/HD is 200 ppb) will be screened for the H component of HT. This result will be compared to the WCL.

Agent Monitoring of HT as H

The Center for Disease Control (CDC) recommended monitoring for HT as HD. The "Final Recommendations for Protecting the Health and Safety against Potential Adverse Effects of Long-Term Exposure to Low Doses of Agents: GA, BV, VX, Mustard Agent (H, HD, Y), and Lewisite (L)" which was published 15 March 1988 reads:

A sixth agent, HT, is a mixture of mustard agent, agent T (Bis (2- chloroethylthioethyl) ether) and impurities. Very little is known about the long-term toxicity of agent T. Agent T has a much lower volatility than the H with which it is mixed. It is not expected to constitute an airborne hazard unless mustard agent is also present at concentrations much higher than permitted. Almost all (99.7%) of the vapor released by HT is mustard agent. HT control limits will therefore be identical with those for HD, with concentrations measured as HD.

Additionally the Federal Register of 3 May, 2004 Vol. 69 No. 85 reads:

The toxicity data for agent T are inadequate for setting exposure limits. The very low vapor pressure for agent T precludes it as a vapor under normal ambient conditions. For sulfur mustard and T mixtures, air monitoring for sulfur mustard alone should be sufficient under most circumstances to prevent airborne exposure to it.

Table 9 presents a comparison of the physical characteristics of HD, HT, and T. A review of the data in this table confirms the CDC recommendation to monitor HT as HD. The bis [2-chloroethyl]-sulfide component of the HT mixture has a higher vapor pressure than the T component and exists in HT at a higher concentration (HT is 60% H and 40% T). ACAMS configured to detect H will allow the operator to respond to releases of HT faster because more of the *bis*[2-chloroethyl]-sulfide component of the mixture will exist as a vapor under normal ambient conditions than will the T component. It is therefore more readily detected by the existing agent monitoring methods.

Table 9 - Physical Characteristics Affecting Monitoring[1]

Chemical Agent Mustard Variants ⇒	HD	T	HT	VX[2]
Vapor Pressure (mm Hg)				
@ 20 °C	0.059			
@ 25 °C	0.11	0.00003	0.08	0.00063
Vapor Density (air = 1)	5.5	9.1	6.3	9.2
Volatility (mg/m^3)				
@ 20 °C	600			
@ 25 °C	910	0.41	831	8.9

[1]Data taken from the agent specific Material Safety Data Sheets

[2]A comparison of the physical characteristics of T to those of VX further emphasizes the low probability of successfully monitoring airborne concentrations of T. VX is a non-volatile, persistent chemical agent. T has less volatility than VX.

Agent Waste Analysis requirements for HT

TOCDF is required to periodically determine the organic content of agent that is fed to the LIC and MPF, and to verify that waste residues that are shipped offsite do not contain agent at concentrations greater than the Waste Control Limit (WCL), which for the mustard agents (HD/H/HT) is 200 parts per billion (ppb).

To meet the waste analysis required associated with the organic content analysis of Agent HT, TOCDF intends to periodically analyze samples of HT collected from the Agent Collection System (ACS) Tanks for the organic analytes bis (2-chloroethyl) sulfide (HD Agent), bis [2-(2-chloroethylthio)ethyl] ether (T), 1,2-*bis* (2-chloroethylthio) ethane (Q), 2-(2-chloroethythio) ethyl 2-chloroethyl ether, 1,2-Dichloroethane, 1,4-Dithiane, and 1,4-Thioxane. The concentration of bis (2-chloroethyl) sulfide will be quantified through the use of a standard. The concentration of the other analytes previously referenced will be semi-quantified based on the area under the instrument response curve for a particular analyte relative to the total of the area under all the instrument response curves of all the analytes. HT analytes, other than bis (2-chloroethyl) sulfide, are essentially being reported as Tentatively Identified Compounds (TICs). The HT is identified as HT based on its relatively low concentration of bis (2-chloroethyl) sulfide which is present in concentrations ranging from 44 to 60 wt. %.

This approach is taken for the HT analysis because of the "defense-in-depth" assurances for complete organic compound destruction provided by the incinerators and their associated process control system instrumentation. Because the T component of the HT mix is worst case equivalent in difficulty to incinerate than the H component, measures of the destruction of the H component can be used as a surrogate measure of the destruction of the T component (i.e., if the H is destroyed, so is the T). The TOCDF incinerator ducts and the Common Stack from which all the incinerators exhaust to the ambient air are equipped with ACAMS that measure the destruction of H. Additionally each incinerator is equipped with carbon monoxide (CO) and oxygen (O_2) CEMS. Low exhaust gas CO concentrations indicate the complete combustion of

the organic compounds fed to the incinerators. These monitoring systems are also part of each incinerator's Automatic Waste Feed Cut-Off (AWFCO) system.

HT Waste Residues Generated from Decontamination

Some HT waste residues are generated from decontamination (e.g., Spent Decon, hydraulic fluid, lube oil, Chemical Assessment Laboratory [CAL] Aqueous Waste, etc.) The agent screen performed on these waste residues is based on determining the presence or absence of the bis (2-chloroethyl) sulfide (H) component of HT, and comparing the results to the Mustard (HD/H/HT) WCL of 200 ppb. An agent screen based on H is selected for HT based on test results documented in the study titled "Thermal Degradation HT" by George W. Warner, Brian K. MacIver and Yu Chu Yang. This study showed that the hydrolysis of HT resulted in an equilibrium value for H that was consistently higher than that of the T component contained in the mixture. Agent screens of waste residues that use H as the basis for analysis are therefore sufficient. The H component of HT is serving as a surrogate measure of the presence of T, therefore the complete destruction of the H component implies complete destruction of the T component.

HT Waste Residues Generated from Incineration

The agent screen that is intended to be performed on HT waste residues generated from incineration (e.g., scrubber brines, incinerator ash, PAS solids, etc.) will be based on determining the concentration of bis (2-chloroethyl) sulfide (H) with the result being compared to the WCL for Mustard (HD/H/HT) of 200 ppb. An agent screen based on H is selected for HT for the following reasons:

- In general, the relative incinerability ranking of H and T; H is as difficult, or more difficult to incinerate than, T. This implies that if H is not present in the incineration residues, neither is T.

- The inability of HT to boil without decomposing; for both H and T to boil require temperatures that also cause the H and T molecules to decomposes. The molecular fragments evolving off the boiling mixture and exiting the munition casing are no longer H or T molecules. These molecular fragments are swept into the exhaust gas stream where they are burned by the 1,100°F plus combustion gases circulating through the MPF combustion chamber.

Table 10 - Boiling Points of Mustard Varients

Chemical Agent Musard Varient ⇒	HD	T	HT
Boiling Point @ 760mm Hg (°F)	423.5 (decomposed)	675 (decomposed)	no constant boiling point
Decomposition Temp. (°F)	423.5	675	329 - 365

Note: Data in this table is taken from the Material Safety Data Sheet for each compound

- The theoretical time required to burn out the agent contained on a tray of mortars drained to five percent heels and bring the metal mass on the tray to a temperature of 1,000 °F for 15 minutes is 16.4 minutes.

  The feed rate controlling zone time that will be used to process 4.2" HT Mortars with 30% heels is 35 minutes for a single zone. The time a tray of mortars will remain in all three zones of the MPF PCC is at least 70 minutes (this time includes the tray transfer times between Zones 1 and 2 and Zones 2 and 3). If the HT heel is completely burned out in Zone 1, the time remaining for a tray advancing from Zone 1, with now essentially a 0% heel, to reside in the MPF PCC is 35 minutes (calculated as 5 minute transfer time between Zones 1 and 2 plus 5 min Zone 2 timer plus 5 minutes transfer time between Zones 2 and 3 plus 20 minutes), which is almost twice the time needed for the metal mass on the tray to be heated to a temperature of at least 1,000°F for 15 minutes (see proposed Permit Condition V.C.1.a.i.d.).

4.2 HT Mortar ECV Storage Increase

This modification proposes to keep the same ECV storage configuration that currently exists for 155mm H projectiles. The difference in the number of 4.2" HT Mortars that can be stored relative to the existing permitted number of 155mm H Projectiles that can be stored is attributed to the smaller diameter and shorter length of the mortars which makes it possible to fit more rejected mortars on the reject table and conveyors. The increase in the number of 4.2" HT Mortars stored in the ECV does not result in an increase in the volume of agent that the ECV is currently permitted because of the smaller size of the mortars relative to the 155mm projectiles. The following table shows this comparison.

Table 11 - ECV Projectile Storage Comparison

ECV Location ⇒	Projo/Mortar Input Conveyor (A Line)	Projo/Mortar Input Conveyor (B Line)	Projo/Mortar Reject System (A Line)	Projo/Mortar Reject System (B Line)	Reject Storage Tray (A Line)	Reject Storage Tray (B Line)	Totals
Number of Items							
Currently Permitted for 155mm H Projos	10	10	20	20	48	48	156
Proposed for 4.2" HT Mortars	13	13	29	29	48	48	180
Agent wt. (lbs)							
Currently Permitted for 155mm H Projos	117	117	234	234	562	562	1825
Proposed for 4.2" HT Mortars	75	75	168	168	278	278	1044
Agent volume (gal)							
Currently Permitted for 155mm H Projos	11.0	11.0	22.0	22.0	52.9	52.9	**172**
Proposed for 4.2" HT Mortars	7.1	7.1	15.8	15.8	26.2	26.2	**99**
Explosive wt. (lbs)							
Currently Permitted for 155mm H Projos	4.1	4.1	8.3	8.3	19.9	19.9	**64.6**
Proposed for 4.2" HT Mortars	1.8	1.8	4.1	4.1	6.7	6.7	**25.2**

Notes:
Maximum permitted ECV storage capacity is 812 gallons.
Density of HT and H is 79.49 lbs/ft^3
Weight of Agent per 155mm projo and 4.2" mortar is 11.7 lbs and 5.8 lbs, resectively
Explosive wt per 155mm projo and 4.2" mortar is 0.414 lbs and 0.14 lbs, respectively.

PMD and MDM Operational Changes and List of Critical Sensors

Attachment 14 Tables 14-4-2 and 14-5-1 list the critical sensors for the Projectile/Mortar Disassembly (PMD) Machine and Multipurpose Demilitarization Machine (MDM), respectively, and are revised for 4.2" Mortar processing.

For the PMDs, during 4.2" Mortar processing both the fuze and burster are removed at the Nose Closure Removal Station (NCRS). Each burster is screwed into the base on of the fuze, removal of the fuze results in removal of the burster. Once removed the burster is unscrewed from the fuze and the two items are conveyed to the DFS feed chute. There are no supplemental charges or miscellaneous parts associated with mortars, so the associated PMD stations used to remove these items are not used during mortar processing.

For the MDMs, HT mortars are drained in a manner to intentionally leave a heel no greater than 30 percent of the initial fill weight. A liquid heel is left inside the HT mortars to prevent the drain probe from contacting any of the paste-like heels observed to be present in some of the HT mortars during the previously referenced PWS testing. Additionally, mortar burster wells are not reinserted into the drained mortars at the Pull and Drain Station (PDS) but are instead discarded to the PDS reject chute and transferred to a container either directly or by a small conveyor where they are accumulated until the container holds approximately the same number of burster wells as there are drained mortars on a MPF feed tray (i.e., 96). When full, the container is placed onto

the tray of drained mortars and fed along with it to the MPF.

As an alternative, should the discarded burster wells be unable to be fed with the mortars, because of equipment failure, they will be fed as Secondary Waste per TOCDF Permit Condition V.C.1.a.ii.a, as miscellaneous metal.

IMPACT TO THE TOCDF

The processing of 4.2" HT Mortars will not adversely impact the ability of TOCDF to protect the human health and the environment.

Environmental Impacts

Some 4.2" HT Mortars are known to contain a paste-like film which has been shown through previous analytical results to contain Hg. The results indicate this Hg contamination to be minimal because when found, the amount of the film is small (i.e., weighing less than a quarter of a pound), and its limited occurrence (about one in five mortars). The paste-like film will remain in the mortar casing after it has been drained and thus to the MPF. TOCDF continuously samples the MPF exhaust gas, with the resulting samples being analyzed for Hg to; 1) create a continuous record of the compliance status of MPF operations in regard to the TOCDF RCRA Permit Hg Performance Standard, and 2) adjust feed rates of waste to ensure compliance with the Hg Performance Standard is maintained.

TOCDF Personnel Impacts

There are no additional impacts to personnel associated with the processing 4.2' HT Mortars over those which are associated with the processing of the DCD Mustard Stockpile in general.

Physical TOCDF Impacts

Physical changes to the TOCDF include the retooling of the PMDs and MDMs. The processing 4.2" HT Mortars in the manner intended is similar to the manner TOCDF has previously processed over one million munitions.

3. PERMIT CHANGE PAGES

Change Pages in Permit Body

Module III, Page 2

Module V, Pages 12, 13, 14, 15, 20, and 22

Module VIII, Pages 1, 2, and 4

Change Pages in Permit Attachments

Attachment 2, Pages 6, 7, 28, 29, 43, 44, 2-A-8, 2-A-9, 2-B-4, and 2-B-5

Attachment 5, Page 23

Attachment 5, Inspection Forms, Page W-16

Attachment 12, Pages 14, and 17

Attachment 14, Pages 3, 23, 25, 26, 28, 31, 32, 34, 35, and 48 through 55

Changes to Permit Drawings

None

Description of Hazardous Waste	Utah, EPA Hazardous Waste #	Maximum Volume, gal				
		CHB	UPA	TMAAirlock /Decon	ECV	UPMC
Agent GB	P999, D003, D002, D004, D006, D007, D008, D009 and D010	15,859	2,972	661	680	3,855
Agent VX	P999, D003, D004, D007, D008, D009 and D010	18,278	3,424	761	833	4,366
Mustard Agents (H, HD, HT)	P999, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D028, D034, D039	15,418	2,880	640	812	4,145
Explosives	P999, D003	-	-	-	-	note 1
Fuzes	P999, D003	-	-	-	-	N/A
Detonators	P999, D005, D008, D003	-	-	-	-	N/A
Initiators	P999, D003	-	-	-	-	N/A
Bursters	P999, D003	-	-	-	-	note 1
Munitions Body Components	P999, D003	-	-	-	-	-
Note 1: See Paragraph 14.4.2.18 for instances when the burster detection system detects energetics in projectiles or mortars.						

III.C.2. The Permittee shall not exceed a maximum storage capacity of 48 overpacks in the CHB at any one time. The Permittee shall not exceed a maximum storage capacity of nine ONCs in the UPA at any one time. The Permittee shall not exceed a maximum storage capacity of two overpacks in the TMA Airlock/Decon Area at any one time.

III.C.3. The Permittee shall not exceed the maximum allowable number of munitions per individual overpack as specified below and shall not exceed the maximum allowable total number of munitions in the CHB, the UPA, the ECV, the TMA Airlock/Decon Area, and the UPMC as specified below:

Munition	Maximum Allowable Number per Overpack	Maximum Allowable Number				
		CHB	UPA	TMAAirlock /Decon	ECV	UPMC
155 mm Projectile	96	4608	864	192	156	1004
Ton Container	2	96	18	4	4	19
4.2" HT Mortar	192	9216	1728	384	~~38~~180	1957

III.C.3.a. Reserved.

III.C.4. The Permittee shall not store hazardous waste that is not identified in Condition III.C.1. in the CHB, UPA, TMA Airlock/Decon Area, ECV, or UPMC. In addition to the permitted

becomes operational, prior to waste feed. Idling shall not be considered as "shut down." A copy of each function test shall be placed in the Operating Record.

V.C. METAL PARTS FURNACE (MPF)

All numeric values included in any of the Conditions under V.C., which are marked with an asterisk (*) (except numeric values for agent GB, which have previously been approved) are tentative and may be modified by permit modification after the results of each trial burn have been evaluated by the Executive Secretary in accordance with R315-8-15.5(c). The Executive Secretary reserves the right to replace the values which are marked with an asterisk as necessary to be protective of human health and the environment.

V.C.1. LIMITATION ON WASTE FEED

V.C.1.a. During processing, the MPF discharge airlock (DAL) shall be monitored for the agents being processed in the MPF. During munitions processing, the MPF DAL shall monitor for agent either by high temperature or low temperature monitoring protocols according to V.C.2.r. and Attachment 22. For secondary wastes, the MPF DAL shall be monitored using low temperature monitoring according to V.B.4 and Attachment 22. Except during the short-term periods specified in Module VI for shakedown, trial burn, and post-trial burn, the Permittee shall incinerate only the following hazardous wastes in the MPF, in compliance with the operating requirements specified in Condition V.C.2.

V.C.1.a.i. Chemical Agent Munitions

Waste Codes: P999, F999, D003, D004, D005, D006, D007, D008, D009,D010, D011, D028, D034, D039						
Maximum Charge Weight (lbs)[2]: 630*						
Mustard (H,HD,HT) Feed Rate (lbs/hr*)[3]: 256.8[1]*						
Item Type	**Zone 1[4] (min)**	**Zone 2[4] (min)**	**Zone 3[4] (min)**	**DAL[4] (min)**	**Items/tray[4] (#)**	**Cycle Time (min)[3]**
Mustard BaselineTon Container (Mustard lbs. per Tray) L2 is ≤220*	85*	10*	100*	100*	1	100*
Mustard BaselineTon Container Mustard lbs. per tray L4 is ≤490*	105*	10*	120*	120*	1	120*
Mustard BaselineTon Container (Mustard lbs. Per Tray) L6 is ≤630*	123*	15*	143*	143*	1	143*
Mustard 155mm Projectiles Full Tray (48 Projos)[5]	TBD*	TBD*	TBD*	TBD*	48	55*
4.2" HT Mortars (Mustard lbs. Per Tray) ≤167*	35	5	20	17	96	35

NOTES:

1 Based on the maximum zone time plus a nominal 5 minute tray transfer time.

2 Maximum mustard (H/HD/HT) charge weight successfully demonstrated during MPF HD Ton Container Agent Trial Burn for condition using ton containers.

3 Cycle time is set by the longest zone time for all zones and does not include tray transfer time.

4 Values based on Discharge Air Lock (DAL) Low Temperature Monitoring (LTM) results obtained during agent trial burn, or as determined through compliance with Condition V.C.1.a.i.c. The zone times presented represent the zone timer set

point and do not include the zone transfer time, which is a constant attribute of the MPF feed system.

[5] Full processing rate of 155-mm projectiles at a minimal cycle time is bounded by the successful performance of a 155-mm projectile Mustard Agent Trial Burn. Chlorine is a limiting parameter when feeding mustard 155mm projectiles.

V.C.1.a.i.a. Mustard ton containers that are sampled in Area 10 with liquid sample analytical results having mercury concentrations of less than one part per million (ppm(mg/kg)) may be processed in the MPF before installation of Pollution Abatement System equipment designed to control emissions of mercury from the MPF.

V.C.1.a.i.b. Mustard ton containers that are sampled in Area 10 with liquid sample analytical results having mercury concentrations equal to one ppm or greater shall not be processed in the MPF until installation of pollution abatement system equipment designed to control emissions of mercury from the MPF.

V.C.1.a.i.c. The charge weights and charge intervals for ton containers may be adjusted to create charge weight and charge interval sets having an equivalent feed rate, on a pounds per hour basis, to that demonstrated during the Agent Trial Burn. Desired charge weight and charge interval sets that differ from those demonstrated during the Agent Trial Burn shall be calculated as follows:

$$(\text{Charge } Wt_{atb} * \text{Charge } Int_{atb}) = \text{Charge } Wt_{set\ n} * \text{Charge } Int_{set\ n}$$

where:

Charge Wt_{atb} = Charge weight demonstrated during the Agent Trial Burn (pounds/charge).
Charge Int_{atb} = Charge interval demonstrated during the Agent Trial Burn (charge/hour).
Charge $Wt_{set\ n}$ = Charge weight (pounds/charge); charge weight shall not exceed maximum weight demonstrated during Agent Trial Burn.
Charge $Int_{set\ n}$ = Charge interval (charge/hour); charge time shall be the greater of the result calculated from the equation above or the minimum charge time of 42 minutes (35 minutes for Zone 1 timer plus 7 minutes for zone to zone tray transition time).

V.C.1.a.i.c.i. For each desired charge weight and charge interval set that includes a charge interval that is greater than the charge interval demonstrated during the trial burn (i.e., the charge time is less than the charge time demonstrated during the trial burn), the Permittee shall:

V.C.1.a.i.c.ii. Reserved

V.C.1.a.i.c.iii. Submit to the Executive Secretary a revised Condition V.C.1.a.i. a feed table incorporating the charge weight and associated primary combustion chamber zone and DAL timer set points and the results of the treatment residue agent analysis..

V.C.1.a.i.d. ~~Reserved.~~ 4.2" HT Mortars shall remain in the Zone 1 of the MPF until a minimum of 35 minutes has expired and; 1) the temperature of Zone 1 has returned to within 10 °F of the control set-point as indicated by the control variable reported by 14-TIC-152; and 2) the Zone 1 water spray valve as indicated by TV-702 has closed.

V.C.1.a.i.d.i ~~Reserved~~ All 4.2" HT Mortars fed to the MPF on the same tray shall be drained to the same heel weight as within the capabilities of the Multipurpose Demilitarization Machines.

V.C.1.a.i.d.ii The Permittee shall notify the Executive Secretary within seven days of establishing the amount of agent to be left as heels in the mortars for processing and thereafter within seven days of revising the amount of HT left as heels in the mortars.

V.C.1.a.i.d.iii The heel weight of drained 4.2" HT Mortars fed to the MPF shall not exceed 30 weight-percent of the initial fill weight of 5.8 pounds per mortar.

V.C.1.a.i.d.iv The Permittee shall establish MPF Discharge Airlock low-temperature monitoring triggers for Zones 1, 2, and 3 and the Primary Chamber Exhaust Temperature as specified in Condition V.C.2.r if the Permittee establishes a 4.2" HT Mortar heel weight equal to or greater than 30 weight-percent of the initial fill weight.

V.C.1.a.ii. Agent Contaminated Secondary Waste

V.C.1.a.ii.a. Agent Contaminated Secondary Waste may be treated in the MPF. The MPF DAL shall be monitored for all agents contaminating the waste by the low temperature monitoring protocol (600°F). The maximum charge weight of secondary waste for each category is specified Table V.C.1 below, based on a minimum 75-minute furnace charge interval:

Category Feed Rates
Table V.C.1

Secondary Waste Category	Waste Stream Subcategory/ Component	Maximum Tray Limit (per charge)	Pounds per 12 hours, on 12 hour rolling average basis
Net Weight of WIC/Container[3] Contents	Net Weight of WIC/Container[3] Contents	2410 pounds maximum	
Combustible Bulk Solid Waste	Ash Content	70* lbs.	670* lbs.
	Halogen Content	97*lbs.	935* lbs.
	BTU Content	3.5* Million BTUs	
	Agent-Contaminated Spill Absorbents	45* lbs	
	DPE Suits, Polyethylene Bags, and carbon filter cartridges (<25 cartridges) Metal bearing secondary shall not be within the MPF primary combustion chamber when halogenated wastes are present, except for metals that are integrated into the waste's design and protective mask carbon canisters.	354*	NA
	Non-Embedded Metals[4] Group 1 (High-Volatile Metals) Mercury (D009)		0.0317*

Category Feed Rates
Table V.C.1

Secondary Waste Category	Waste Stream Subcategory/ Component	Maximum Tray Limit (per charge)	Pounds per 12 hours, on 12 hour rolling average basis
	Non-Embedded Metals[4] Group 2 Semi-volatile Metals Lead (D008 Cadmium (D006) Antimony Thallium Tin Zinc		47.5*
	Non-Embedded Metals[4] Group 3 Low Volatile Metals Arsenic (D004) Chromium (D007) Barium (D005) Boron Cobalt Copper Selenium (D010) Silver (D011) Beryllium Aluminum Manganese Nickel Vanadium		20.8*
Non-Combustible Bulk Solid Waste	Aluminum	1000* lbs.	
	Glass/Ceramics	2410* lbs.	
	Miscellaneous Metal[5]	2410* lbs.	
	Carbon Filter Cartridges-Aluminum Housing only	25* each	
	Building Materials: Concrete	To Be Determined[2]*	
	Building Materials: Foam Core Panels	To Be Determined[2]*	
Sludge	ACS, AQS, SDS Agent-Contaminated Sludges and Aqueous Wastes	45* lbs.	

Table Notes

Note 1: Unless successive trays are tracked to ensure the 12-hour limit is not exceeded, each WIC shall not exceed any one of the indicated limits. The indicated limits may be exceeded on a WIC as long as the 12-hour are complied with by limiting feeds on subsequent trays. If each WIC is limited to the indicated limits, the 12-hour limit will not be exceeded.

Note 2: Successful treatment of these materials must be approved by the Executive Secretary

Note 3: Waste Incineration Containers (WICs) are defined as the assembly of metal components that is used to contain, feed, and convey individual charges of secondary wastes and their resulting treatment residues through the MPF (i.e., Cut-away Ton Containers (CTCs), burn trays, rectangular open topped baskets equipped with catch pan).

Note 4: Non-embedded metals are metals that may vaporize or become entrained in the combustion gas air during thermal treatment.

Note 5: Includes 4.2" HT Mortar burster wells.

V.C.1.a.iii. Secondary wastes may be treated in the MPF only if the following conditions are met:

Tag Number	Limit	Descriptions
14-TIT-152[2] or 14-TIT-391[2]	≥1,528[1]*°F (Baseline TC) ≥TBD[1]*°F (155mm H Projos)	Furnace Temperature (Zone 1)
14-TIT-141[2] or 14-TIT-392[2]	≥1,464[1]*°F (Baseline TC) ≥TBD[1]*°F (155mm H Projos)	Furnace Temperature (Zone 2)
14-TIT-153[2] or 14-TIT-393[2]	≥1,561[1]*°F (Baseline TC) ≥TBD[1]*°F (155mm H Projos)	Furnace Temperature (Zone 3)
14-TIT-065 or 14-TIT-069	≤ 800°F	MPF Afterburner Temperature Low-Low
14-TIT-065 or 14-TIT-069	> 2175° F	MPF Afterburner Temperature High-High
14-PDIT-786	≥1.2 in. w.c.	Afterburner Exhaust Gas Velocity Pressure High
14-AIT-384m	≥1000 ppm 1-minute average. Correct to 7%-O_2, dry volume	Blower Exhaust CO Concentration. Average of 4 consecutive data points excluding points of calibration. Approximately 1- minute average.
24-AIT-669m	≥1000 ppm 1 minute average. Correct to 7%-O_2, dry volume	Blower Exhaust CO Concentration. Average of 4 consecutive data points excluding points of calibration. 1- minute average.
14-AIT-082	≤3% O_2	Blower Exhaust O_2
14-AIT-082	≥15% O_2	Blower Exhaust O_2 60 second delay
24-AIT-670	≤3% O_2	Blower Exhaust O_2
24-AIT-670	≥15% O_2	Blower Exhaust O_2 60 second delay
PAS 703AH/BH	≥0.2 SEL for Mustard. Malfunctions not included.	PAS Blower Exhaust Agent Detected
PAS 707 AH/BH/CH	≥0.2 SEL. Malfunctions not included.	Common Stack Exhaust Agent Detected
14-TIT-010[2]	≥2,385*°F	Primary Chamber Exhaust Temperature. Mustard Ton Containers

[1] To Be Determined during shakedown per an approved DAL monitoring plan.
[2] Not required for 4.2" HT Mortar processing for heels less than 30 weight percent.

Waste Codes: P999, D002, D003, D004, D005, D006, D007, D008, D009, D010

Agent Feed Rate (lbs/hr)[1]: Not Applicable for Mustard (H/HD/HT)

Propellant/Explosive Pyrotechnic (PEP) Feed Rate (lbs/hr)[2]: 479

Explosive Contaminated ECR Maintenance Residue Feed Rate (lbs/drop)[3]: 3.6

Item Type	PEP (lbs/item)	Maximum Item Processing Rate (items/hr)	Equivalent PEP Feed Rate (lbs/hr)
4.2" Mortar bursters and fuses[4]	0.14	274	38.4
155-mm Mustard Projectiles bursters and supplemental charges[5]	0.414	276	115

NOTES:
[1] An agent feed rate to the DFS is not applicable during the Mustard Campaign since mustard is not drained from mustard containing munitions in the ECRs (i.e., drained munition casings are not fed to the DFS during Mustard Campaign). P999 waste code is retained to account for incidental mustard contamination that may be on bursters removed from leaking munitions.
[2] PEP feed rate demonstrated during DFS VX Agent Trial Burn.
[3] ECR Maintenance Residues allowed to be processed are identified in Attachment 2, Table 2-2a of this permit. When processing explosive-contaminated ECR Maintenance Residues an internal kiln spacing of one flight between successive drops.
[4] 4.2" HD and HT mortars contain the same type and amount of explosives. PEP feed may include some incidental mortar propellant that was not removed during reconfiguration. M6 propellent charges weight 0.43 per charge.
[5] Types 104 and 110 155mm projectiles contain the same type and amount of explosives.

V.D.1.a.i. Energetics from only one munition type (i.e., 155mm projectile energetics or 4.2" mortar energetics), or waste generated from one chemical agent campaign, shall be fed to the DFS, at any given time.

V.D.1.a.ii. Explosive Contaminated ECR maintenance residues shall be fed at a rate not to exceed 3.6 pounds per two-minute period. Non-explosive contaminated ECR maintenance residues generated during the mustard campaign shall be fed at a rate not to exceed 10 pounds per two minute period and 100 pounds per hour.

V.D.1.b. The Permittee shall not incinerate any chemical agent, or any waste containing the chemical agent, for which treatment has not been successfully demonstrated through a trial burn in accordance with Module VI or by other means approved by the Executive Secretary.

V.D.1.c. The Permittee shall not incinerate any hazardous waste in the DFS that contains organic hazardous constituents as described in R315-50-10, that are more difficult to destroy than the material demonstrated in the surrogate trial burn.

V.D.1.d. The feed rate of chlorine to the DFS shall not exceed 6.8* pounds per hour over twelve hour rolling average.

V.D.1.e. The Permittee shall conduct sufficient analysis of the waste treated in the DFS to verify that the waste feed is within the physical and chemical composition limits specified, in

MODULE VIII
DEMILITARIZATION
MISCELLANEOUS TREATMENT UNITS

VIII.A. **APPLICABILITY**

VIII.A.1. The requirements of this module pertain to the miscellaneous units described in Attachment 14 (Demilitarization Miscellaneous Treatment Units) and listed below in Conditions VIII.A.1.a through VIII.A.1.f.

VIII.A.1.a. Reserved.

VIII.A.1.b. Two Projectile/Mortar Disassembly Machines (PMDs) located in the ECRs.

VIII.A.1.c. Three Multipurpose Demilitarization Machines (MDMs) and the associated Pick and Place Machines (PKPLs) located in the Munitions Processing Bay (MPB).

VIII.A.1.d. Two Bulk Drain Stations (BDSs) located in the MPB.

VIII.A.1.e. Reserved.

VIII.A.1.f. One Air Operated Remote Ordnance Access System (Cutter Machine), which can be located in either ECR, or in the MPB.

VIII.A.2 The Permittee may feed uncut bursters from M104, ~~and~~ M110 mustard 155mm projectiles, and 4.2 inch mortars to the DFS.

VIII.B. **ALLOWABLE WASTE FEED**

VIII.B.1. Reserved

VIII.B.2. The Permittee may treat 155-mm projectiles, and 4.2 inch mortars (hazardous waste codes P999, D002, D003, D004, D006 through D010, D028, D034, and D039) in the PMDs and the MDMs/PKPLs to comply with rates specified in Modules V and VI for the DFS and MPF.

VIII.B.3. The Permittee may treat ton containers, (hazardous waste codes P999, D002, D003, D004, and D006 through D010, D028, D034, and D039) in the BDSs to comply with rates specified in Modules V and VI for the MPF.

VIII.B.4. The Permittee is prohibited from treating waste in the miscellaneous units, identified in Condition VIII.A.1 that is not identified in Conditions VIII.B.2 and VIII.B.3.

VIII.C. **IGNITABLE AND INCOMPATIBLE WASTES**

VIII.C.1. Ignitable wastes (D001) shall not be treated in the ECRs or MPB.

VIII.C.2. The Permittee shall place only munitions or bulk containers with one type of chemical agent (e.g., GB, VX or Mustard) in the MPB at one time. Only one chemical agent may be placed in the ECRs.

VIII.C.3. The Permittee shall not place chemical agent or munitions containing that chemical agent in a container that previously held a different chemical agent or munitions containing a different chemical agent until the container has been decontaminated to less than 1 VSL.

VIII.D. **DESIGN AND OPERATING REQUIREMENTS**

VIII.D.1. The Permittee shall comply with the design and operating requirements specified in Attachment 14 (Demilitarization Miscellaneous Treatment Units) of the Permit.

VIII.D.2. The Permittee shall comply with the requirements specified in the Attachment 9 (Contingency Plan) when there has been a release that escapes engineering controls or a fire, explosion, or detonation from the operation of the PMDs, MDMs, or BDSs.

VIII.D.3. If equipment in the ECRs or down line of the ECRs shuts down, any munitions or munition components being processed in the ECRs may remain in the ECRs until the equipment in question is operational. Alternatively, facility personnel may don appropriate PPE and physically retrieve the munitions or munition components from the ECRs and manually place the item(s) into an appropriate overpack for subsequent storage in the Toxic Maintenance Area (TMA). These activities shall be documented for each day of occurrence in the Operating Record.

VIII.D.4. If the equipment in the MPB or down line of the MPB shuts down, any bulk containers, munitions, or associated components being processed in the MPB may remain in the MPB until the equipment in question is operational. Alternatively, facility personnel may don appropriate PPE and physically retrieve munitions or munition components from the MPB and manually place the item(s) into an appropriate overpack for subsequent storage in the TMA. These activities shall be documented for each day of occurrence in the Operating Record.

VIII.D.5. The Permittee shall maintain sensors and interlocks identified as critical in the tables of Attachment 14 (Demilitarization Miscellaneous Treatment Units) so that they are functional when the associated miscellaneous unit is operating. The Permittee is allowed to complete processing of any partially processed munition when a sensor or interlock identified as critical ceases to function.

VIII.D.6. Munition rejects exiting any of the miscellaneous units identified in Condition VIII.A shall be transferred to the ECV, UPMC, MPB, or the TMA for pre-treatment under an Emergency Permit, returned to storage, or placed back into the miscellaneous unit to complete treatment with the exception of 155mm mustard projectiles rejected by the PMDs solely because of stuck bursters or 4.2 inch mortars rejected by the PMD for failure to remove the fuze. The mustard 155mm projectiles that have been rejected by the PMDs solely because of stuck bursters or 4.2 inch mortars rejected by the PMD for failure to remove the fuze may be rejected back to the ECV for storage until the PMD has been retooled to enable mechanical dislodging of the buster or commencement of the associated leaker/reject campaign. The mustard 155mm projectiles permitted storage capacity of the

VIII.E.5. If the evaluation conducted in accordance with Condition VIII.E.3 indicates that the drain is sufficient, then the bulk container may be considered adequately drained and fed to the MPF. This determination shall be documented in the Operating Record.

VIII.E.6. If the fill weight for a given ton container, as listed in the Deseret Chemical Depot (DCD) inventory, is less than the standard fill weights (1800 lbs Mustard), then the Permittee may opt to apply the following criteria when evaluating consistency between the quantity removed and the bubbler reading.

VIII.E.6.a. If the quantity of agent removed from a ton container is less than the minimum required to enable feed to the MPF, indicating that the residual liquid and solid heel is greater than the maximum allowed the Permittee shall comply with Condition VIII.E.3 and Condition VIII.E.4 or VIII.E.5.

VIII.E.6.b. If the quantity of agent removed from the ton container is greater than or equal to the minimum required to enable feed to the MPF indicating that the residual liquid and solid heel is less than the maximum allowed then the ton container may be considered adequately drained and fed to the MPF.

VIII.E.7. The Permittee shall use the bubbler system and the AQS associated with the MDM to determine if projectiles or mortars processed in the MDM are drained. If the Permittee is unable to determine if the projectile or mortar is drained using the bubbler system and the AQS, the Permittee shall orally notify the Executive Secretary within 24 hours. An AQS adequate drain determination consists of an indication of flow into the AQS. The Permittee shall record the bubbler readings and the AQS reading for each projectile or mortar drained in the Operating Record. If the quantity of agent removed is not consistent with all ~~complete~~ drain indications for the munitions on that tray, then the Permittee shall not feed the tray of projectiles or mortars to the MPF and shall follow the requirements specified below:

VIII.E.7.a. The Permittee shall conduct a visual inspection and physical measurement to ascertain the drain status. The Permittee shall record the results of this evaluation in the Operating Record.

VIII.E.8. If the visual inspection and physical measurement evaluation conducted in accordance with Condition VIII.E.7.a indicates that the drain is insufficient, then the Permittee shall orally notify the Executive Secretary as to which one of the following courses of action shall be implemented:

VIII.E.8.a. The Permittee shall perform corrective maintenance on the MDM. The munition will then be drained again. The drain status will be re-evaluated according to Condition VIII.E.7.a or;

VIII.E.8.b. The Permittee shall comply with Condition VIII.E.11.

VIII.E.9. If the visual inspection and physical measurement evaluation conducted in accordance with Condition VIII.E.7.a indicates that the drain is sufficient, then the munition may be considered adequately drained and fed to the MPF.

2.2.1.3.6.9.1 Table 2-A-1: Physical Properties of Chemical Agent (as a pure substance)

2.2.1.3.6.9.2 Table 2-A-2: Chemical Agent Composition

2.2.1.3.7 Mustard 155mm Projectiles

2.2.1.3.7.1 The initial characterization and continuing processing verification sampling will be performed in accordance with the plans approved by the Executive Secretary.

2.2.1.3.7.2 If variation of the agent in the initial characterization sampling is found outside the specified limits in the sampling plan, modifications of the initial and verification sampling may be required as determined by the Executive Secretary.

2.2.1.3.7.3 Thirty additional samples will be collected from lots specified in the Mustard 155mm Projectile Sampling Plan for continuous verification for a total of 15 samples or 30 total for both liquid and solid matrices. One additional verification sample set shall be collected and analyzed every six months until the end of the projectile campaign.

2.2.1.3.7.4 Each verification sample set shall consist of one solid and one liquid sample from each of five separate projectiles for a total of 10 samples per verification sample set (five solid and five liquid).

2.2.1.3.7.5 Each liquid sample from each verification sample set from the projectiles specified in 2.2.1.3.7.3 and 2.2.1.3.7.4 shall be analyzed for agent organic content (i.e., purity and impurities), and HRA metals (and chlorine for the quarterly samples).

2.2.1.3.7.6 Each solid sample from each verification sample set from the projectiles specified in 2.2.1.3.7.3 and 2.2.1.3.7.4 shall be analyzed for HRA metals (and chlorine for the quarterly samples).

2.2.1.3.7.7 Analysis results shall not necessarily be available prior to MPF treatment of the sampled projectiles.

2.2.1.3.7.8 Sample verification analyses results will be immediately sent to the DSHW Chemical Demilitarization Section Manager at the same time results are reported to EG&G.

2.2.1.3.8 4.2 Inch HT Mortars

2.2.1.3.8.1 The initial characterization and continuing processing verification sampling will be performed in accordance with the plans approved by the Executive Secretary.

2.2.1.3.8.2 Verification samples shall be collected from an ACS Tank and analyzed for the metals specified in 2.2.1.3.4 at a minimum of once per week. The verification sample from each fifth tank sampled will additionally be analyzed for the organic analytes listed in Table 2-A-2b.

2.2.1.3.8.3 Initial characterization and verification analysis results shall not necessarily be available prior to MPF treatment of the sampled HT Mortars or LIC treatment of the HT removed from the mortars.

2.2.1.3.8.4 Sample verification analyses results will be immediately sent to the DSHW Chemical Demilitarization Section Manager at the same time results are reported to EG&G.

2.2.1.4. Spent Decontamination Solutions

2.2.1.4.1. Spent decontamination solutions treated on site shall be treated in the primary or secondary chambers of the LICs.

2.2.1.4.2. Spent decontamination solution collected in SDS-TANK-101, SDS-TANK-102, or SDS-TANK-103 shall be sampled and analyzed. Spent decontamination solutions shall be analyzed for chemical agent concentration, corrosivity (pH), specific gravity, HRA metals, TC volatile organics, explosives, and screened for organics.

2.2.1.4.2.1 The parameters of agent concentration, pH, specific gravity, and the organic screen shall be determined for each tank of spent decontamination solution processed. The results shall be available prior to incineration.

2.2.1.4.2.2 Confirmatory analyses for HRA metals, TC volatile organics and explosives in spent decontamination solutions shall be performed quarterly.

2.2.1.4.2.3 The sampling and analyses of spent decontamination solutions for the purpose of demonstrating compliance with Subpart CC regulations shall be performed as described in Section 2.10 of this attachment.

2.2.1.4.3. If results of the organic screen show that the spent decontamination solution contains organics in excess of five percent, the tank of spent decontamination solution shall be analyzed per Table 2-0. The Executive Secretary shall be notified prior to treatment of the solution.

2.2.1.4.4. If chemical agent is detected above the Waste Control Limit (WCL) (i.e., 20 parts per billion (ppb) for GB, 20 ppb for VX, and 200 ppb for Mustard), additional decontamination solution shall be added to the tank, the contents of the tank shall be recirculated (i.e., mixed), and another sample shall be analyzed for agent. This procedure shall be repeated until the chemical agent concentration is below the limits specified above.

2.2.1.5. Agent Collection System (ACS) & Agent Quantification System (AQS), Spent Decontamination System (SDS) Maintenance Residues

2.2.1.5.1 The chemical agent contaminated debris and sludges generated from the maintenance of the ACS, AQS, and SDS equipment located in the Munitions Demilitarization Building (MDB), but outside the Explosive Containment Rooms (ECRs), can be incinerated in the Metal Parts Furnace (MPF).

2.2.1.5.1.1. ACS tank bottoms shall be characterized prior to treatment in the MPF. Samples shall be analyzed for HRA metals.

2.2.1.5.2. Collected ACS/AQS maintenance residues shall be weighed and characterized prior to incineration to ensure feed rates established for the MPF are not exceeded. The Operating Record shall include a detailed description of the residues fed to the MPF.

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS[5,7]	PREPARATION and ANALYTICAL METHODS[1,5]	FREQUENCY OF ANALYSIS[5] (Establish Profile)	SAMPLING METHOD[5]
2.2.1.3. Chemical Agent (Initial Waste Profile)	LIC 1 LIC 2 MPF	Based on an Approved Agent Sampling and Analysis Plan.	Based on an Approved Agent Sampling and Analysis Plan	Prior to agent campaign, sampling/analysis requirements based on agent specific sampling plan.	Based on an Approved Sampling and Analysis Plan
		(Baseline Ton Containers Only) HRA Metals	 TE-LOP-584 and TE-LOP-557, or 3050, or 3051, or 3052 and 6010 or 6020 and 7470	During the Baseline Mustard TC campaign, one liquid sample analyzed from each TC stored at DCD, Area 10 prior to transfer to TOCDF	
		Mustard 155mm Projectiles Agent Purity (Liquid Only) Agent Organic Impurities (Liquids) HRA Metals (Liquid and Solid)	 TE-LOP-584 TE-LOP-584 Including TICs TE-LOP-584 and TE-LOP-557, or 3050, or 3051, or 3052 and 6010 or 6020 and 7470	Three Samples from each of the five lots specified below both liquid and solid matrices. (30 total sample analyses) EA-2-9 EA-2-4 EA-4-30 EA-4-33 EA-4-32 *The Unknown lot will be addressed at a later date prior to processing	Based on an Approved Sampling and Analysis Plan
		4.2" HT Mortars (Initial Waste Profile)	Based on an Approved Agent Sampling and Analysis Plan	Once, after munitions representing manufacturing lots stored at DCD have been drained to ACS Tank	Based on an Approved Agent Sampling and Analysis Plan

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS[5,7]	PREPARATION and ANALYTICAL METHODS[1,5]	FREQUENCY OF ANALYSIS[5] (Establish Profile)	SAMPLING METHOD[5]
2.2.1.3 Chemical Agent (Process Analysis)	LIC 1 LIC 2 MPF DFS	Agent Organic Content (Purity and Impurities) HRA Metals Density	TE-LOP-584 TE-LOP-584 and TE-LOP-557 or 3050, or 3051, or 3052 and 6010 or 6020 and 7470 and TE-LOP-584	During each agent campaign, one sample analyzed for each munitions/bulk item campaign or every three months, which ever is shorter	Tap or Remote Agent Sampling System if sample is collected from ACS-Tank-101 or 102 or Tap if collected from the Agent Quantification System or Pipette if agent sample is taken directly from munitions or bulk container
	ACS-TANK-101, 102	4.2" HT Mortars HRA Metals Agent Organic Content (Purity and Impurities) Density	 TE-LOP-584 and TE-LOP-557, or 3050, or 3051, or 3052 and 6010 or 6020 and 7470 TE-LOP-584 TE-LOP-584	One representative sample from the ACS tank weekly ~~of Baseline Mustard TC processing during the MPF shakedown period.~~ One representative sample from every fifth ACS tank sampled for metals	Tap or Remote Agent Sampling System if sample is collected from ACS-Tank-101 or 102 or Tap if collected from the Agent Quantification System
Chemical Agent (Process Verification Sample Analysis)	MPF	Mustard 155mm Projectiles Agent Purity (Liquid Only) Agent Organic Impurities (Liquid HRA Metals (Liquid and Solid)	 TE-LOP-584 TE-LOP-584 Including TICs TE-LOP-584 and TE-LOP-557, or 3050, or 3051, or 3052 and 6010 or 6020 and 7470	On sample from each of the following lots specified below for both the liquid and solid matrices. (30 total samples): EA-2-5* will be sampled towards the end of the campaign EA-2-7 EA-2-10 EA-4-2 EA-4-3 EA-4-4 EA-4-6 EA-4-7 EA-4-8 EA-4-9 EA-4-10 EA-4-14 EA-4-17 EA-4-34 EA-4-37	Based on an Approved Sampling and Analysis Plan

Table 2-4a
Metals (Universal Treatment Standards)

1	Antimony	1.15 mg/l TCLP	6	Chromium (Total)	0.6 mg/l TCLP	11	Silver	0.14 mg/l TCLP
2	Arsenic	5 mg/l TCLP	7	Lead	0.75 mg/l TCLP	12	Thallium	0.2 mg/l TCLP
3	Barium	21 mg/l TCLP	8	Mercury	0.025 mg/l TCLP	13	Vanadium	1.6 mg/l TCLP
4	Beryllium	1.22 mg/l TCLP	9	Nickel	11 mg/l TCLP	14	Zinc	4.3 mg/l TCLP
5	Cadmium	0.11 mg/l TCLP	10	Selenium	5.7 mg/l TCLP			

Table 2-4b[1]
Volatile Organic Compounds Universal Treatment Standards

1	Acetone (160 mg/kg)	15	1,2-Dibromoethane (15mg/kg)	29	1,1,1,2-Tetrachloroethane (6mg/kg)
2	Benzene (10mg/kg)	16	Dibromomethane (15mg/kg)	30	1,1,2,2-Tetrachloroethane (6mg/kg)
3	Bromodichloromethane (15mg/kg)	17	1,1-Dichloroethane (6mg/kg)	31	Tetrachloroethylene (6 mg/kg)
4	Bromomethane (15mg/kg)	18	1,2-Dichloroethane (6mg/kg)	32	Toluene (10mg/kg)
5	2-Butanone (Methyl ethyl ketone 36 mg/kg)	19	1,1-Dichloroethylene (6mg/kg)	33	Tribromomethane (Bromoform) (15mg/kg)
6	Carbon disulfide (4.8mg/l TCLP)	20	*trans*-1,2-Dichloroethylene (30mg/kg)	34	1,1,1-Trichloroethane (6mg/kg)
7	Carbon tetrachloride (6 mg/kg)	21	1,2-Dichloropropane (18mg/kg)	35	1,1,2-Trichloroethane (6mg/kg)
8	Chlorobenzene (6mg/kg)	22	*cis*-1,3-Dichloropropylene (18mg/kg)	36	Trichloroethylene (6mg/kg)
9	2-Chloro-1,3-butadiene (0.28mg/kg)	23	*trans*-1,3-Dichloropropylene (18mg/kg)	37	Trichlorofluoromethane (30mg/kg)
10	Chlorodibromomethane (15mg/kg)	24	1,4-Dioxane (170mg/kg)	38	1,2,3-Trichloropropane (30 mg/kg)
11	Chloroethane (6mg/kg)	25	Ethylbenzene (10mg/kg)	39	1,1,2-Trichloro-1,2,2-trifluoroethane (30 mg/kg)
12	Chloroform (6mg/kg)	26	Iodomethane (65mg/kg)	40	Vinyl Chloride (6 mg/kg)
13	2-Chloroethyl vinyl ether (NA)	27	Methylene chloride (30mg/kg)	41	Xylene (o-m-,p-) (30 mg/kg)
14	Chloromethane (30mg/kg)	28	Methyl isobutyl ketone (33 mg/kg)		

[1] TOCDF may demonstrate compliance with organic constituents Universal Treatment Standards if good-faith analytical efforts achieve detection limits for the regulated organic constituents that do not exceed the treatment standards specified in the table found in 40 CFR 268.40 by an order of magnitude.

Table 2-4c[1]
Semi-Volatile Organic Compounds (Universal Treatment Standards)

1	Acenaphthylene (3.4mg/kg)	23	p-Cresol (5.6mg/kg)	45	Hexachlorocyclopentadiene (2.4mg/kg)
2	Acenaphthene (3.4mg/kg)	24	Dibenz(a,h)anthracene (8.2mg/kg)	46	Hexachloroethane (30mg/kg)
3	Acetophenone (38mg/kg)	25	m-Dichlorobenzene (6mg/kg)	47	Indeno(1,2,3-c,d) pyrene (3.4mg/kg)
4	Aniline (14mg/kg)	26	o-Dichlorobenzene (6mg/kg)	48	Naphthalene (5.6mg/kg)
5	Anthracene (3.4mg/kg)	27	p-Dichlorobenzene (6mg/kg)	49	2-Naphthylamine (NA)
6	Benz(a)anthracene (3.4 mg/kg)	28	2,4-Dichlorophenol (14mg/kg)	50	2-Nitroaniline (14mg/kg)
7	Benzo(b)fluoranthene (6.8mg/kg)	29	2,6-Dichlorophenol (14mg/kg)	51	4-Nitroaniline (28mg/kg)
8	Benzo(k)fluoranthene (6.8mg/kg)	30	Diethyl phthalate (28mg/kg)	52	Nitrobenzene (14 mg/kg)
9	Benzo(g,h,i)perylene (1.8mg/kg)	31	2,4-Dimethyl phenol (14mg/kg)	53	2-Nitrophenol (13mg/kg)
10	Benzo(a)pyrene (3.4mg/kg)	32	Dimethyl phthalate (28mg/kg)	54	4-Nitrophenol (29mg/kg)
11	4-Bromophenyl phenyl ether (15mg/kg)	33	Di-n-butyl phthalate (28mg/kg)	55	Pentachlorobenzene (10mg/kg)
12	Butyl benzyl phthalate (28mg/kg)	34	1,4-Dinitrobenzene (2.3mg/kg)	56	Pentachloroethane (6mg/kg)
13	p-Chloroaniline (16mg/kg)	35	4,6-Dinitro-o-cresol (160mg/kg)	57	Pentachloronitrobenzene (4.8 mg/kg)
14	*Bis*(2Chloroethoxy)methane (7.2mg.kg)	36	2,4-Dinitrophenol (160mg/kg)	58	Pentachlorophenol (7.4mg/kg)
15	*Bis*(2-Chloroethyl)ether (6mg/kg)	37	2,4-Dinitrotoluene (140mg/kg)	59	Phenanthrene (5.6mg/kg)
16	*Bis*(2-Chloroisopropyl) ether (7.2mg/kg)	38	2,6- Dinitrotoluene (28mg/kg)	60	Phenol (6.2 mg/kg)
17	4-Chloro-3-methylphenol (14mg/kg)	39	Di-n-octyl phthalate (28mg/kg)	61	Pyrene (8.2mg/kg)
18	2-Chloronaphthalene (5.6mg/kg)	40	Diphenylamine (13mg/kg)	62	1,2,4,5-Tetrachlorobenzene (14mg/kg)
19	2-Chlorophenol (5.7mg/kg)	41	Fluoranthene (3.4mg/kg)	63	2,3,4,6-Tetrachlorophenol (7.4 mg/kg)
20	Chrysene (3.4mg/kg)	42	Fluorene (3.4mg/kg)	64	1,2,4-Trichlorobenzene (19mg/kg)
21	o-Cresol (5.6mg/kg)	43	Hexachlorobenzene (10mg/kg)	65	2,4,5-Trichlorophenol (7.4mg/kg)
22	m-Cresol (5.6mg/kg)	44	Hexachlorobutadiene (5.6mg/kg)	66	2,4,6-Trichlorophenol (7.4mg/kg)

[1] TOCDF may demonstrate compliance with organic constituents Universal Treatment Standards if good-faith analytical efforts achieve detection limits for the regulated organic constituents that do not exceed the treatment standards specified in the table found in 40 CFR 268.40 by an order of magnitude.

Table 2-A-2b
HT-Filled 4.2 Inch Mortars, Liquid Contents
CHEMICAL AGENT COMPOSITION[1]

AGENT	CHEMICAL CONSTITUENT	Average Value	Maximum Value	Minimum Value
HT	**Organic Compounds (Weight Percent)**			
	Bis (2-chloroethyl) sulfide (HD)[2]	TBD	TBD	TBD
	bis [2-(2-chloroethylthio)ethyl] ether (T)[3]	TBD	TBD	TBD
	1,2-*bis* (2-chloroethylthio) ethane (Q)[3]	TBD	TBD	TBD
	2-(2-chloroethythio) ethyl 2-chloroethyl ether[3]	TBD	TBD	TBD
	1,2-Dichloroethane[3]	TBD	TBD	TBD
	1,4-Dithiane[3]	TBD	TBD	TBD
	1,4-Thioxane[3]	TBD	TBD	TBD
	Chlorine[4]	TBD	TBD	TBD
	Metals (mg/kg)			
	Aluminum	TBD	TBD	TBD
	Antimony	TBD	TBD	TBD
	Arsenic	TBD	TBD	TBD
	Barium	TBD	TBD	TBD
	Beryllium	TBD	TBD	TBD
	Boron	TBD	TBD	TBD
	Cadmium	TBD	TBD	TBD
	Chromium	TBD	TBD	TBD
	Cobalt	TBD	TBD	TBD
	Copper	TBD	TBD	TBD
	Lead	TBD	TBD	TBD
	Manganese	TBD	TBD	TBD
	Mercury	TBD	TBD	TBD
	Nickel	TBD	TBD	TBD
	Selenium	TBD	TBD	TBD
	Silver	TBD	TBD	TBD
	Thallium	TBD	TBD	TBD
	Tin	TBD	TBD	TBD
	Vanadium	TBD	TBD	TBD
	Zinc	TBD	TBD	TBD

Notes:
1. The Initial characterization has not yet been performed. This table will be updated when data becomes available.
2. Quantitative analysis using calibration standard.
3. Reported as Tentatively Identified Compounds (TICs), a semi-quantitative analysis based on percent of area under the chromatogram response curves.
4. The value for chlorine is determined from analysis.

Table 2-A-2b
HT 4.2 Inch Mortars, Solid Contents
CHEMICAL AGENT COMPOSITION[1]

AGENT	CHEMICAL CONSTITUENT	Average Value	Maximum Value	Minimum Value
HT	Organic Compounds (Weight Percent)			
	Chlorine[2]	TBD	TBD	TBD
	Metals (mg/kg)			
	Aluminum	TBD	TBD	TBD
	Antimony	TBD	TBD	TBD
	Arsenic	TBD	TBD	TBD
	Barium	TBD	TBD	TBD
	Beryllium	TBD	TBD	TBD
	Boron	TBD	TBD	TBD
	Cadmium	TBD	TBD	TBD
	Chromium	TBD	TBD	TBD
	Cobalt	TBD	TBD	TBD
	Copper	TBD	TBD	TBD
	Lead	TBD	TBD	TBD
	Manganese	TBD	TBD	TBD
	Mercury	TBD	TBD	TBD
	Nickel	TBD	TBD	TBD
	Selenium	TBD	TBD	TBD
	Silver	TBD	TBD	TBD
	Thallium	TBD	TBD	TBD
	Tin	TBD	TBD	TBD
	Vanadium	TBD	TBD	TBD
	Zinc	TBD	TBD	TBD

Notes:
1. The Initial characterization has not yet been performed. This table will be updated when data becomes available.
2. The value for chlorine is determined from analysis.

TABLE 2-B-5
Metals in Munitions[1] (Metals with Feed Rate Limitations - Module V)

Metals[2]	Sb	As	Ba	Be	Cd	Cr[3]	Pb	Hg	Ag	Tl
4.2" Mortars, Agent HT, Full Tray of 96 Mortars										
TOTAL EMBEDDED METALS[1,4] (pounds)	NR	NR	NR	NR	0.042	4.49	NR	NR	NR	NR
TOTAL NON-EMBEDDED METALS[4] (pounds)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Metals in Paint[4]	NR	NR	1.75	NR	0.902	0.501	3.15	NR	NR	NR
Metals in Liquid Agent[5]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Metals in Purple Paste Agent Residue[5]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Notes:

6. The metals within the munitions' metal are considered to be fixed (embedded, inert) and will not vaporize at furnace temperatures. The values are not included in the Non-Embedded Metals totals.
7. NR – not reported, no information provided. TBD-To Be Determined during Initial Characterization Sampling and Analysis.
8. No distinction between different chromium valences (e.g., identification of hexavalent chromium) can be made from the available information.
9. The non-embedded metals values attributed to the munitions paint is a function of the munitions' surface areas: 4.2" Mortars are 1.88 ft^2; 96 each.
10. Based on a 4.2" Mortars filled with nominal 5.8 pounds of agent HT, 34% of mortars have a purple paste heel weighing 0.19 lbs, liquid HT and paste containing the average metals concentrations from initial characterization.

TABLE 2-B-6
Metals in Munitions[1] (Other Metals of Interest)

Metals[2] 4.2" Mortars, Agent HT, Full Tray of 96 Mortars	Se	Ni	V	Al	B	Cu	Mn	Sn	Co	Zn
TOTAL EMBEDDED METALS[1,4] (pounds)	NR	8.59	NR	NR	NR	NR	12.03	NR	NR	NR
TOTAL NON-EMBEDDED METALS[4] (pounds)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Metals in Paint[4]	NR	0.902	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Liquid Agent[5]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Metals in Purple Paste Agent Residue[5]	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Notes:

6. The metals within the munitions' metal are considered to be fixed (embedded, inert) and will not vaporize at furnace temperatures. The values are not included in the Non-Embedded Metals totals.
7. NR – not reported, no information provided. TBD-To Be Determined during Initial Characterization Sampling and Analysis.
8. No distinction between different chromium valences (e.g., identification of hexavalent chromium) can be made from the available information.
9. The non-embedded metals values attributed to the munitions paint is a function of the munitions' surface areas: 4.2" Mortars are 1.88 ft^2; 96 each..
10. Based on a 4.2" Mortars filled with nominal 5.8 pounds of agent HT, 34% of mortars have a purple paste heel weighing 0.19 lbs, liquid HT and paste containing the average metals concentrations from initial characterization.

Table 2-C-1
ENERGETIC/AGENT NOMINAL WEIGHT
FOR
CHEMICAL AGENT MUNITIONS/BULK CONTAINERS

MUNITION	MODEL /AGENT	DIMENSIONS			AGENT		BURSTER			PROPELLANT		FUSE MODEL	OTHER ENERGETIC COMPONENTS
		DIAMETER	LENGTH (INCHES)	WEIGHT (LBS)	TYPE	WEIGHT (LBS)	MODEL	EXPLOSIVE	WEIGHT (LBS)	MODEL	WEIGHT (LBS)		
4.2-inch Mortar	M2	4.2 inch	21.0	24.67	HD	6.0	M~~1~~422	Tetryl	0.14	-	-	M8	M2 Primer
				24.47	HT	5.8							
155-mm Projectile	M104	155 mm	26.8	98.9	H	11.7	M6	Tetrytol	0.414	--	--	--	
	M110												
Ton Containers	Agent HD	30.1	85.1	3,400	HD	1,800	--	--	--	--	--	--	--

NOTES:
NA = Information not available;
H, HD, and HT = Mustard
TNT = 2,4,6-trinitrotoluene; $CH_3C_6H_2(NO_2)_3$
Tetryl = 2,4,6-trinitrophenylmethylnitramine; $(NO_2)_3C_6H_2N(NO_2)CH_3$
Tetrytol = 70% Tetryl, 30% TNT

Table 2-C-2
COMPOSITION OF REACTIVE MATERIAL IN MUNITIONS

MUNITION	COMPONENT			WEIGHT	COMPOSITION
M2~~A1~~(4.2-inch mortar)	1.	Fuze, M8			
		a.	M~~1~~422 Burster Assembly	65.2 grams	Tetryl[d]
	2.	Detonator, M18			
		a.	Upper Charge	50 mg	Overall Mixture: 33.5% Potassium Chlorate, 32.2% Antimony Sulfide, 28.3% Lead Azide, 5.0% Carborundum
		b.	Intermediate Charge	157 mg	Lead Azide
		c.	Lower Charge	70 mg	Tetryl[d]
		d.	Relay Charge	130 mg	Tetryl[d]

Notes:
[d] Tetryl = 2,4,6-trinitrophenylmethylnitramine; $(NO_2)_3C_6H_2N(N)_2)CH_3$

TABLE 5-8
ENVIRONMENTAL INSPECTION
FOR THE
EXPLOSIVE CONTAINMENT ROOM VESTIBULE (ECV)
CONTAINER STORAGE AREA

ITEM 264.15(b)(1)	TYPES OF PROBLEMS 264.15(b)(3)	FREQUENCY 264.15(b)(4)
Deteriorating/Leaking Containers	Inspect the containers for deterioration (i.e., rupture, corrosion, released material, etc.).	Weekly
Closed Containers	Ensure that all container covers/closure devices are secured in a closed position so that there are no visible holes, gaps or other open spaces into the interior of the container. R315-8-22 [40 CFR 264.1086(c)(3)] identifies allowable exceptions to this requirement.	Weekly
Containers in Storage (Permitted Capacity)	Ensure that the number of containers in storage does not exceed the limits specified in Module III.	Weekly
Storage Base	Inspect floors for cracks or gaps in the concrete or the concrete coating.	Weekly
General Area	Inspect the storage area for apparent spills or leaks from the containers.	Weekly

Notes: Visual inspection performed remotely by Control Room Operator(s).

Mustard 155mm projectiles that have been rejected from the PMD back into the ECV solely due to a stuck burster do not have nose closures and 4.2" Mortars that have been rejected from the PMD back into the ECV solely due to the inability to remove the fuze. In ~~this~~ these cases, the burster well continues to function as the container closure device that contains the agent inside. Verification will consist of 1) the lack of visible leakage, and 2) the lack of an ECV ACAMS reading.

TABLE 5-9
ENVIRONMENTAL INSPECTION
FOR THE
UPSTAIRS MUNITIONS CORRIDOR (UPMC)
CONTAINER STORAGE AREA

ITEM 264.15(b)(1)	TYPES OF PROBLEMS 264.15(b)(3)	FREQUENCY 264.15(b)(4)
Deteriorating/Leaking Containers	Inspect the containers for deterioration (i.e., rupture, corrosion, released material, etc.).	Weekly
Closed Containers	Ensure that all container covers/closure devices are secured in a closed position so that there are no visible holes, gaps or other open spaces into the interior of the container. R315-8-22 [40 CFR 264.1086(c)(3)] identifies allowable exceptions to this requirement.	Weekly
Containers in Storage (Permitted Capacity)	Ensure that the number of containers in storage does not exceed the limits specified in Module III.	Weekly
Storage Base	Inspect floors for cracks and gaps in the concrete or the concrete coating.	Weekly
General Area	Inspect the storage area for apparent spills or leaks from the containers.	Weekly

Notes: Visual inspection performed remotely by Control Room Operator(s).

ENVIRONMENTAL INSPECTION LOG FOR THE ECV CONTAINER STORAGE AREA

Weekly - Physical

1. **Mark with an S any items found to be satisfactory. Mark with a U any items found to be unsatisfactory and describe unsatisfactory conditions in comments.** *Inspection to be performed by visual inspection (e.g., CCTV, advisor screens in control room, etc.).*

   a. ( ) **Storage Base (floor)** - *Inspect floors for cracks and gaps in the concrete or the concrete coating (Att 5, Table 5-8).*

   b. ( ) **General Area** - *Inspect the storage area for apparent spills or leaks from the containers (Att 5, Table 5-8).*

   c. ( ) **Number of containers in storage in the ECV** - *Ensure that the number of containers in storage does not exceed the limits specified below: (Att 12, Table 12-4)*

Munition/Bulk Container	Number in Storage	Maximum Number Allowed
155-mm Projectiles		156
Ton Containers		4
4.2" Mortars		~~38~~180

   d. ( ) **Integrity of Containers** *(i.e., absence of deterioration, corrosion, released material, etc.) (Att 5, Table 5-8).*

   e. ( ) **Closed Containers** - *Ensure that all containers covers/closure devices are secured in a closed position so that there are not visible holes, gaps or other open spaces into the interior of the container (Att 5, Table 5-8).*

   Notes: 1. The required inspections for the material handling equipment and the sumps (ICUs) located in this room are addressed on other inspection logs located in Attachment 5.
   2. Mustard 155mm projectiles that have been rejected from the PMD back into the ECV solely due to a stuck burster do not have nose closures. In this case, the burster well continues to function as the container closure device that contains the liquid agent inside. Verification will consist of 1) the lack of visible leakage, and 2) the lack of an ECV ACAMS reading.

2. Describe corrective actions taken, including any work orders (by number) generated to address conditions found to be unsatisfactory. **Document any abnormal conditions associated with the above inspection criteria.**

_____

Inspector Print / Sign _____ Date _____ Time

Table 12-2
Maximum Number of Containers to be Stored in the ECV

Description[1]	Tag #	Length (in ECV)	Munition Type		
			155 mm Projectile	Ton Container	4.2 inch Mortar
Tray Input Bypass Conveyor No.2 (A)Bypass Conveyor No.3 (A) (See Note 3)	MMS-CNVP-103 MMS-CNVP-105	8'-4" 14'-9" 23-1"	N/A	2	N/A
Projectile/Mortar Input Conveyor No. 5 (A)[2]	PHS-CNVM-109	24'-1"	10	N/A	13
Projectile/Mortar Input Conveyor No. 5 (B)[2]	PHS-CNVM-110	24'-1"	10	N/A	13
Bypass Conveyor No. 3 (B)(See Note 3)	MMS-CNVP-104 MMS-CNVP-106	4'-8" 18'-2" 22'-10"	N/A	2	N/A
Projectile Reject System (A)	PHS-REJC-101	N/A	20	N/A	~~6~~29
Reject Storage Tray (A)	NA		48		48
Projectile Reject System (B)	PHS-REJC-102	N/A	20	N/A	~~6~~29
Reject Storage Tray (B)	NA		48		48
TOTAL			**156**[4]	**4**	~~38~~**180**[4]

1. (A) = A line, (B) = B line
2. The values were calculated by dividing the length of the conveyor by the length of each munition (quotient rounded down to the nearest integer). The length of each munition is as follows: 155 mm projectile - 2.2 ft; 4.2 inch Mortar - 1.8 ft.
3. The values were calculated by dividing the total length of both conveyors by the length of a cradle/tray (quotient rounded down to nearest integer) and multiplying by the number of bulk containers per cradle/tray. The length of a cradle/tray is 9 ft and one cradle/tray can hold the following quantity: 1 Ton Container.

4The munitions identified may be stored on the conveyors or reject systems as indicated above or on the floor of the ECV. When stored on the floor, they shall be elevated as necessary to prevent contact with standing liquids.

Table 12-4
Volume of Agent Stored in UPA, ECV and UPMC

Munition Type	Agent	Weight (lbs)	Density (lb/ft^3)	Volume (gal/container)	UPA		ECV		UPMC	
					# of Containers	Volume (Gal)	# of Containers	Volume (Gal)	# of Containers	Volume (Gal)
155-mm Projectile	H	11.7	79.49	1.1	864	951	156	172	1,004	1,105
Ton Containers	HD	1,700	79.49	160	18	2,880	4	640	19	3,040
4.2-inch Mortar	HD	6.0	79.49	0.6	1,728	976	38	22	1,957	1,105
	HT	5.8	79.49	0.5	1,728	943	~~38~~180	~~21~~99	1,957	1,068

Note: The 4.2 inch mortars are not allowed in the ECV when 155mm projectiles are present. HD and HT mortars will not be stored at the same time. Total mustard agent volume allowed in the ECV is 812 gallons.